

Exhibit M

UNITED STATES DISTRICT COURT
NORTHERN DISTRICT OF CALIFORNIA
OAKLAND DIVISION

IN RE APPLE IPHONE ANTITRUST
LITIGATION

Civil Action No. 4:11-cv-06714-YGR

DONALD R. CAMERON, et al.

Civil Action No. 4:19-cv-03074-YGR

Plaintiffs,

v.

APPLE INC.,

Defendant,

EXPERT REPORT AND DECLARATION OF ROBERT D. WILLIG

August 10, 2021

CONFIDENTIAL DOCUMENT
Lodged Pursuant to Local Rule 79-5(c)-(d)

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I. Qualifications

1. My name is Robert D. Willig. I am Professor of Economics and Public Affairs Emeritus at Princeton University, where I have held a joint appointment in the Economics Department and at the Woodrow Wilson School of Public and International Affairs since 1978. Previously, I was a Supervisor in the Economics Research Department of Bell Laboratories. My teaching and research have specialized in the fields of industrial organization, government-business relations, and social-welfare theory.
2. I served as Deputy Assistant Attorney General for Economics in the Antitrust Division of the U.S. Department of Justice from 1989 to 1991, and in that capacity served as the Division's Chief Economist. Among my many responsibilities was developing the economic content of the forthcoming Horizontal Merger Guidelines.
3. I am the author of Welfare Analysis of Policies Affecting Prices and Products, Contestable Markets and the Theory of Industry Structure (with William Baumol and John Panzar), and some eighty articles and chapters in the professional literatures of economics and law. I am also a co-editor of The Handbook of Industrial Organization, which summarizes the state of economic thinking on the structure of industries and the nature of competition among firms, and have served on the editorial boards of the American Economic Review, the Journal of Industrial Economics, and the MIT Press Series on Regulation. I am an elected Fellow of the Econometric Society and was an associate of The Center for International Studies.
4. I have developed and applied research and expertise on market structure, competitive conduct, business combinations, contractual relations, intellectual property, and optimal pricing. I have been a consultant to firms in many sectors of the economy, including telecommunications, transportation, health care, pharmaceuticals, aeronautics, automobiles, information technology, chemicals, energy, consumer products, and financial markets.
5. I have appeared as an expert witness before Congress, federal and state courts, federal administrative agencies, and state public utility commissions on subjects involving intellectual property rights, competition, regulation, and antitrust. I have also served as a consultant to the Federal Trade Commission, the U.S. Department of Justice, and many leading corporations on antitrust, regulation, intellectual property, and policy issues.
6. A list of my articles, books and other professional publications and activities is presented in my curriculum vitae, attached as Appendix A. Appendix B lists all of the cases for which I have testified at trial or deposition during the last four years.
7. This expert report and declaration has been prepared by me. I have been assisted by the staff of Compass Lexecon acting under my direction and supervision. The rate charged by Compass Lexecon for my work on this matter is \$1,450 per hour. I have a financial interest in the overall profitability of Compass Lexecon, but I have no financial interest in the outcome of this case.
8. A complete list of materials I relied on in formulating the opinions contained herein can be found at Appendix C.

II. Assignment and Summary of Conclusions

II.A. Assignment

9. I have been asked by counsel for Apple Inc. (“Apple”) to address the following:
- Discuss the economic principles to be used in defining relevant antitrust markets in this matter;
 - Assess Plaintiffs’ experts’ claims concerning the market definition that should be applied in this matter;
 - Assess Plaintiffs’ experts’ claims that defining the relevant antitrust market in this case is an issue common to the proposed classes;
 - Evaluate Plaintiffs’ experts’ claims concerning market power in light of their proposed market definitions;
 - Evaluate the relationship between Apple’s intellectual property and Plaintiffs’ experts’ claims concerning impact and damages; and
 - Evaluate Plaintiffs’ experts’ claims concerning impact and damages for apps with no marginal cost and apps that monetize through a mix of advertising and subscription revenue.
10. I make this declaration in support of Apple’s Opposition to Developer Plaintiffs’ Motion for Class Certification; Apple’s Opposition to Consumer Plaintiffs’ Motion for Class Certification; Apple’s Motion to Exclude the Testimony of Einer Elhauge, Nicholas Economides, and Christian Tregellis; Apple’s Motion to Exclude the Testimony of Daniel McFadden; and Apple’s Motion to Compel Plaintiffs to Submit Trial Plan.

II.B. Summary of Conclusions

11. Based on my analysis as well as my experience and expertise, I have reached the following principal conclusions:

Market definition principles

12. **Opinion 1.** The App Store is a two-sided transaction platform that facilitates transactions between two distinct groups of customers—in this case, app developers and app users. An owner of a transaction platform, in order to maximize its profit and the value of the platform, must carefully balance the prices and other terms that apply to the customers on each side. The two-sidedness of a transaction platform must inform the definition of any relevant market in which that platform competes. In particular, because of the linkages between the two groups of customers, any changes in price or other terms by the platform owner toward the customers on one side can affect the demand for the platform’s services from customers on the other side. (See section V.)
13. **Opinion 2.** The relevant market must include the sources of the competitive constraints on the challenged behavior of a firm. Thus, because each side of a two-sided transaction platform influences the impact on the platform of actions targeted at the other side, delineating the relevant market for a two-sided transaction platform must include analysis of both sides of the platform—here, the app developers and app consumers—

and evaluation of the demand substitution opportunities of each. Restricting attention to the customers on only one side of the transaction platform would render the resulting market definition unreliable because its scope would exclude a significant competitive constraint, viz., the customers on the omitted side of the platform. (See section IV.)

14. **Opinion 3.** When evaluating market power, or performing a Hypothetical Monopolist Test for market definition, in a two-sided market, it is analytically incorrect to consider only a price on one side of the market. These analyses should be conducted using a two-sided price that accounts for the costs and benefits to both side of the platform. (See sections V and VI.D.2.)
15. **Opinion 4.** Diverse, non-substitutable products can be validly clustered into a single relevant market only when the competitive conditions for each product in the cluster are the same. (See section VI.A.)

Market definition in this case

16. **Opinion 5.** There is no singular app transaction market. As Professor Hitt has demonstrated, there are at least two groups of iOS app transactions that face distinctly different competitive conditions than other app transactions. Each of these groups constitute a distinct relevant app transaction market. (See section VII.A)
17. **Opinion 6.** Digital game transactions comprise a distinct relevant app transaction market. Digital game transactions face a unique set of competitive conditions because many iOS users can and do consummate digital game transactions on a unique set of other transaction platforms in lieu of the App Store. Moreover, developers can and do substitute digital app transactions away from the App Store to other digital game transaction platforms. (See section VII.A.1.)
18. **Opinion 7.** TV and video streaming app transactions comprise a distinct relevant app transaction market. TV and video streaming app transactions face a unique set of competitive conditions because iOS users can and do consummate video streaming transactions on a unique set of other transaction platforms in lieu of the App Store. Moreover, developers can and do substitute video streaming app transactions away from the App Store to other transaction platforms. (See section VII.A.2.)
19. **Opinion 8.** Market definition is not a common issue because class members differ according to the relevant app transaction markets in which they purchase or sell. (See section VII.B.)

Plaintiffs' experts are wrong to cluster all iOS app transactions into a single relevant market

20. **Opinion 9.** Plaintiffs' experts are incorrect to cluster all iOS app transactions into a single relevant market. Clustering multiple products not substitutable for each other into the same relevant market can be valid only when the competitive conditions for each product in the cluster are the same. Plaintiffs' experts have not analyzed whether the competitive conditions for all app transactions are the same, have not shown that they are, and cannot show that they are, because such a proposition is demonstrably untrue. (See section VI.)

21. **Opinion 10.** Professor Elhauge misportrays the test in the Horizontal Merger Guidelines for price-discrimination markets. His argument crucially relies on his assertion that a price-discrimination market can be defined only if one group is unaffected. That is baseless. The Horizontal Merger Guidelines address the case where some customers are harmed more than others, not just when some customers are harmed but others are not. (See section VI.C.)
22. **Opinion 11.** Professor Elhauge's purported Hypothetical Monopolist Test is incorrect for three reasons. First, Professor Elhauge improperly considers only average commission rates, which obscures intraclass variations in the difference between actual-world and but-for world commission rates. Second, Professor Elhauge improperly considers only one-sided prices (the price the platform charges developers) rather than two-sided prices, and thus ignores the benefits the platform provides to consumers that attract them to the platform where they discover and purchase developers' apps and in-app content. Third, Professor Elhauge fails to analyze the competitive pressures on Apple in either the actual or the but-for world. (See section VI.D.)

Plaintiffs' experts' single-brand relevant market based on an aftermarket paradigm is inappropriate

23. **Opinion 12.** Plaintiffs' experts are incorrect in claiming that iOS apps and in-app content is an aftermarket. Many iOS users can consummate app transactions with developers on transaction platforms other than the App Store. Thus, because consumers and developers can substitute across transaction platforms without requiring substitution in the foremarket, the aftermarket framework does not apply. Moreover, Plaintiffs' experts fail to demonstrate that Apple has an incentive to treat the purported aftermarket for iOS app transactions as a separate independent avenue for profit maximization, rather than respecting the linkage of the vitality of the iOS app ecosystem as a crucial driver of its overall iPhone business. (See section IX.)

Plaintiffs' experts' market power opinions are unreliable

24. **Opinion 13.** Plaintiffs' experts fail to reliably address issues of market power because they rely on only improperly defined relevant markets. To reliably analyze allegations of monopolization, questions of market power must be asked with respect to properly defined relevant markets. This failure cannot be rectified by appeal to arguments about Apple's profitability. (See section VIII.)

Apple would still have the incentive to monetize its IP in alternative ways in the but-for world

25. **Opinion 14.** Plaintiffs' experts essentially ignore that all developers must license Apple's intellectual property to create iOS apps in both the actual world and in their proposed but-for world. In a but-for world where Apple could no longer require that the App Store be the exclusive platform for transacting in iOS apps, Apple would have the economic incentive to monetize its IP in alternative ways, rather than allow developers to use and profit from Apple's IP for nothing more than the current \$99 per year developer fee. (See section X.B.)

26. **Opinion 15.** Alternative IP monetization mechanisms would have differential impacts on purported class members. If Apple employed real world examples of other software IP monetization strategies in the but-for world, such as the ad valorem royalty rate model employed by Epic's Unreal Engine, or the tiered fixed-fee royalty model employed by Unity, individual inquiry into each developer would be required to determine which developers were damaged and which benefitted from the alleged anti-competitive conduct. (See section X.C.)

Consumers of certain types of apps were uninjured by the challenged conduct

27. **Opinion 16.** For many apps, an additional purchase of the app does not generate any material incremental fixed-dollar marginal cost to the developer. For such zero-marginal cost apps, economic principles demonstrate that a reduction in commission rates would have no impact on the developer's choice of price. Thus, consumers that purchased only these types of apps are uninjured (i.e., they would have paid the same price for an app in the actual and but-for world). (See section XI.A.)
28. **Opinion 17.** Some apps (such as a newspaper app like the New York Times) monetize through a combination of in-app advertising revenue and subscription fees. Economic principles demonstrate that these apps are a special case where a decrease in the commission rate charged on in-app subscription purchases will result in a profit motivation for the developer to increase the subscription price. Thus, consumers that purchased only these types of apps benefitted from the alleged anti-competitive conduct (i.e., they would have likely paid more for an app in the but-for world than in the actual world). (See section XI.B.)

III. Introduction

III.A. Apple and the App Store

29. Apple is a technology company that “designs, manufactures and markets smartphones, personal computers, tablets, wearables and accessories, and sells a variety of related services.”¹ Its products include: the Mac line of personal computers that run on the macOS operating system; the iPhone line of smartphones that runs on the iOS operating system; the iPad line of tablets that run on the iPadOS operating system, and various wearables, home, and accessories products, including AirPods, the Apple Watch, and Apple TV, among others.²
30. The macOS, iOS, and iPad iOS are proprietary software operating systems created and maintained by Apple.³ For simplicity, I refer to both iOS for the iPhone and iPadOS for the iPad as “iOS,” as there is no substantive difference between them for purposes of my analysis. Similarly, all of my analysis and opinions concerning the iPhone also apply to the iPad.

¹ Apple Inc. Form 10-K for the fiscal year ended September 26, 2020 (hereafter “Apple 10-K 2020”), at 1.

² Apple 10-K 2020, at 1.

³ Apple 10-K 2020, at 1.

31. The first iPhone was launched in 2007 with only a small number of pre-installed apps, all of which were developed by Apple.⁴ In March 2008, Apple simultaneously announced the availability of an iPhone software development kit (“SDK”) and creation of the App Store, so that third-party developers could build apps for use on iPhones, distribute them to iPhone users via the App Store, and Apple could maintain the safety and security of these applications to ensure the iPhone would be a safe and reliable device for consumers.⁵
32. When the App Store was first launched, the IP licensing deal offered by Apple was as follows:
- A developer wishing to create a native iOS app uses Apple software and tools and other intellectual property provided under Apple’s Developer Program to develop and test the app. In order to obtain a license to the required Apple software, the developer enters into the Apple Developer Program Licensing Agreement (DPLA).⁶
 - All apps to be distributed on the App Store have to pass Apple’s App Review Process so that Apple can exercise control to exclude certain kinds of apps from the App Store, such as porn, malicious apps, and apps that invade a user’s privacy.⁷
 - The developer chooses a price tier that sets the price the user must pay to purchase the app or in-app content, and this price can be as low as zero.⁸

⁴ “How many Apple apps are pre-loaded on current iPhone models? The first iPhone included 13 integrated Apple apps. There were no third-party apps available for that iPhone.” (Online Platforms and Market Power, Part 6: Examining the Dominance of Amazon, Apple, Facebook, and Google: Questions for the Record from the Honorable David N. Cicilline, Chairman, Subcommittee on Antitrust, Commercial and Administrative Law of the Committee on the Judiciary, Questions for Mr. Tim Cook, CEO, Apple Inc., U.S. House of Representatives Committee Repository, July 29, 2020, <<https://docs.house.gov/meetings/JU/JU05/20200729/110883/HHRG-116-JU05-20200729-QFR054.pdf>>, accessed on February 10, 2021 (hereafter “Mr. Cook’s Responses to Questions for the Record from the Honorable David N. Cicilline”), at 1.)

⁵ See, e.g., Luke Dormehl, “Today in Apple history: Devs get the key to unlock iPhone’s awesome power,” Cult of Mac, March 6, 2020, <<https://www.cultofmac.com/469975/today-in-apple-historyiphone-sdk/>>, accessed on August 10, 2021; and Arnold Kim, “Steve Jobs Announces 3rd Party SDK for iPhone for February 2008,” MacRumors, October 17, 2007, <<https://www.macrumors.com/2007/10/17/steve-jobs-announces-3rd-party-sdk-for-iphone-for-february-2008/>>, accessed on August 10, 2021.

⁶ “In order to use the Apple Software and Services, You must first accept this Agreement. If You do not or cannot accept this Agreement, You are not permitted to use the Apple Software or Services. Do not download or use the Apple Software or Services in that case.” (“Apple Developer Program License Agreement,” Apple Developer, June 22, 2020 (hereafter “DPLA”), at § 1.1, APL_APPSTORE_10137264–342, at 264.) Before executing the DPLA, a developer must also execute (and remain a party to) the separate Apple Developer Agreement, which specifies “[t]erms and conditions that govern the use of the Apple Developer website, beta software, events, and more.” (“Agreements and Guidelines for Apple Developers,” Apple Developer, <<https://developer.apple.com/support/terms/>>, accessed on August 10, 2021.) The Apple Developer Agreement itself is available at “Apple Developer Agreement,” Apple Developer, June 7, 2021, <<https://developer.apple.com/support/downloads/terms/apple-developer-agreement/Apple-Developer-Agreement-20210607-English.pdf>>, accessed on August 10, 2021.

⁷ “App Store Review Guidelines,” Apple Developer, <<https://developer.apple.com/app-store/review/guidelines/>>, accessed on August 10, 2021; and “Steve Jobs introduces the App store - iPhone SDK Keynote,” YouTube » gamingandtechnology, March 13, 2008, <https://www.youtube.com/watch?v=xo9cKe_Fch8>, at 4:50.

⁸ DPLA, Schedule 2, at ¶ 3.1, APL_APPSTORE_10137343–88, at 45. “All of the Licensed Applications shall be marketed by Apple, on Your behalf, to End-Users at prices identified in a price tier and designated by

- The user pays Apple for the price, if positive, of the app, and Apple bears the responsibilities and costs of effectuating the transaction.⁹
 - Apple hosts the app and implements the download process onto a user's iPhone.¹⁰
 - Apple pays the developer 70 percent of the price paid by the user and retains 30 percent as a commission, with no commission to Apple for the download of a free app.¹¹
33. This licensing deal has remained essentially the same until the present day, except for certain refinements and changes that have generally benefitted developers:
- In March 2009, Apple announced that it would allow post-sale transactions called "in-app purchases," ("IAPs") rather than limiting developers to choosing between only (a) apps requiring an upfront purchase or (b) free apps. The revenue split between Apple and the developer for an in-app purchase was the same as for an upfront purchase (i.e., 30 percent).¹²
 - In October 2009, a restriction was relaxed allowing developers to implement in-app purchases for free apps, as opposed to only paid apps as had been the case previously.¹³
 - In February 2011, Apple announced that it would begin allowing publishers of content-based apps (newspapers, video, music, etc.) to sell subscriptions via an IAP. The publisher sets the price and length of subscription (e.g., annual). After electing to choose the subscription, the user is charged using the App Store billing system for both (a) the initial subscription and (b) automatic renewals after the expiration of each subscription period. When first introduced, Apple received a 30 percent

You, in Your sole discretion, from the pricing schedule attached to this Schedule 2 as Exhibit C, which may be updated from time to time by Apple on App Store Connect. In addition, You may, at Your election via App Store Connect, instruct Apple to market the Licensed Applications at a discount of 50% of Your established price tier for authorized institutional customers. You may change the price tier for any Licensed Application at any time, at Your discretion, in accordance with the pricing schedule set forth on that Exhibit C as updated from time to time, using tools provided on the App Store Connect tool. As Your agent and/or commissioner, Apple shall be solely responsible for the collection of all prices payable by End-Users for Licensed Applications acquired by those End-Users under this Schedule 2." The list of price tiers "is set forth in the App Store Connect tool and may be updated by Apple from time to time." (DPLA, Exhibit C, APL_APPSTORE_10137343–88, at 56.) A developer may choose from additional "Alternate Tiers," although these do not change the set of available US prices. ("The US prices do not change in the Alternate Tiers." Graham Spencer, "A Beginner's Guide to App Store Pricing Tiers," *MacStories*, September 1, 2015, <<https://www.macstories.net/stories/a-beginners-guide-to-app-store-pricing-tiers/>>, accessed on August 10, 2021.)

⁹ "iPhone SDK Launch," Apple, March 6, 2008 (hereafter "iPhone SDK Launch"), APL-APPSTORE_00000055–87 at 75.

¹⁰ iPhone SDK Launch, APL-APPSTORE_00000055–87 at 75.

¹¹ iPhone SDK Launch, APL-APPSTORE_00000055–87 at 75.

¹² Transcript of Preview Developer Beta of iPhone OS 3.0 Town Hall Presentation, March 17, 2009, APLAPPSTORE_00000004–26 at 06–07.

¹³ Rob Griffiths, "Apple allows in-app purchasing for free App Store apps," *Macworld*, October 15, 2009, <<https://www.macworld.com/article/1143339>>, accessed on August 10, 2021.

commission on each subscription transaction (the initial transaction and each renewal).¹⁴

- In June 2016, Apple reduced the commission on recurring subscriptions to 15 percent (from 30 percent) after the first year, and made the recurring subscription model available to all apps rather than only content-based apps.¹⁵
- Since 2016, the Apple Video Partner Program has offered a lower 15% commission on IAP transactions to “apps that deliver premium subscription video entertainment services” in return for agreeing “to integrate with a number of Apple technologies, such as Universal Search, Siri, AirPlay, and single sign-on or zero sign-on, to ensure a seamless experience for customers.”¹⁶ As a result of this integration, these apps are featured on the Apple TV app and throughout tvOS, and their content is discoverable through Universal Search and Siri.”^{17,18}
- In November 2020, Apple introduced a Small Business Program under which developers that earned less than \$1 million selling digital goods and services on the App Store in the previous calendar year can qualify for a reduced 15 percent commission.¹⁹

III.B. Summary of Plaintiffs’ Claims

34. This report addresses two class action lawsuits Apple faces concerning its App Store policies—the *Cameron* case, brought on behalf of a putative class of developers (the “Developers”²⁰) and the *Pepper* case, brought on behalf of a putative class of consumers (the “Consumers”²¹). Throughout this report I refer to the Developers and Consumers together as “Plaintiffs.”

¹⁴ “Apple Launches Subscriptions on the App Store,” Apple Newsroom, February 15, 2011, <<https://www.apple.com/newsroom/2011/02/15Apple-Launches-Subscriptions-on-the-App-Store/>>, accessed on August 10, 2021.

¹⁵ Roger Fingas, “Apple announces it will offer App Store subscriptions to all apps, take smaller 15% cut,” Apple Insider, June 8, 2016, <<https://appleinsider.com/articles/16/06/08/apple-announces-it-will-offer-app-store-subscriptions-take-smaller-15-cut>>, accessed on August 10, 2021.

¹⁶ See “Apple Video Partner Program,” Apple Developer, <<https://developer.apple.com/programs/video-partner/>>, accessed on August 10, 2021.

¹⁷ See “Apple Video Partner Program,” Apple Developer, <<https://developer.apple.com/programs/video-partner/>>, accessed on August 10, 2021.

¹⁸ “The Video Partner Program is another example of Apple reducing its commission. There are nearly 130 developers in this program. Premium subscription video entertainment providers earn a lower commission if they agree to integrate their apps with Apple TV.” (Mr. Cook’s Responses to Questions for the Record from the Honorable David N. Cicilline, at page 9.)

¹⁹ “Apple announces App Store Small Business Program,” Apple, November 18, 2020, <<https://www.apple.com/newsroom/2020/11/apple-announces-app-store-small-business-program/>>, accessed on August 9, 2021.

²⁰ By “Developers,” with a capital “D,” I mean members of the proposed Developer Class. See Expert Report and Declaration of Lorin Hitt Ph.D., at Figure 4 and ¶ 56. (“The developer class complaint focuses only on U.S. developers that have at least one paid app download or paid in-app purchase transaction during the class period. Applying this definition results in 67,938 developers in the proposed class. In other words, the proposed developer class consists of only 5.0 percent of all developers that have transacted with consumers through the U.S.”)

²¹ By “Consumers,” with a capital “C,” I mean members of the proposed Consumer Class. See Expert Report and Declaration of Lorin Hitt Ph.D., at ¶ 24. (“The proposed consumer class represents 45 percent of the

35. The Developers claim that “Apple attained monopoly power in the U.S. market for iOS app and in-app-product distribution services by slamming the door shut on any and all potential competitors,” by not permitting “anyone else to distribute apps and related digital products to the many millions of U.S. owners of its mobile devices.”²² The Developers further allege that “Apple’s market power has allowed it to charge developers a supra-competitive 30% commission on the sale of paid apps and in-app products.”²³ The Developers seek (a) an injunction to, among other things, “prohibit[] Apple from continuing to: charge supra-competitive distribution fees...; mandate minimum pricing and pricing in sums ending in \$.99; and bar competitors from providing distribution services or retail sales services to iOS developers”²⁴ and seek(b) “monetary relief, whether by way of restitution ... or damages, including treble damages....”²⁵
36. The Consumers similarly claim that “from the time it launched the iPhone through the present date, Apple has engaged in an anticompetitive scheme to monopolize the aftermarket for iOS applications (including purchases made within applications...) in order to control and derive supracompetitive profits from the distribution of iOS apps worldwide.”²⁶ Consumer plaintiffs further allege that “Apple’s unlawful monopolization of the apps market has enabled Apple to charge and collect a supracompetitive 30% fee from iOS Device consumers for each and every one of the billions of iOS apps they have bought since the iPhone’s launch thirteen years ago.”²⁷ The Consumers seek to have Apple enjoined from “monopolizing or attempting to monopolize the iOS applications aftermarket” and seeks damages caused by Apple’s alleged antitrust violations.²⁸

III.C. Summary of Plaintiffs’ Motions for Class Certification

37. The Developers filed a motion in which they seek to have the Court certify a class consisting of “All U.S. developers of any Apple iOS application or in-app product (including subscriptions) sold for a non-zero price via Apple’s iOS App Store at any time on or after June 4, 2015.”²⁹ This class certification motion claims that “common issues overwhelmingly predominate” and that “Plaintiffs’ Sherman Act claims entail a bundle of related common questions, including inquiry into the relevant market; whether Apple

455 million consumer accounts that have transacted with developers through the U.S. App Store storefront during the consumer class period because it excludes consumer accounts that only transact free apps.”)

²² Donald R. Cameron, et al. v. Apple Inc, Plaintiffs’ Consolidated Class Action Complaint for Violations of the Sherman Act and California Unfair Competition Law, No. 4:19-cv-03074-YGR, September 30, 2019, United States District Court Northern District of California Oakland Division (hereafter “Developers’ Complaint”), at ¶ 2.

²³ Developers’ Complaint, at ¶ 3.

²⁴ Developers’ Complaint, at ¶ 134.

²⁵ Developers’ Complaint, at 47.

²⁶ In re Apple iPhone Antitrust Litigation, Third Amended Consolidated Class Action Complaint, No. C 11-06714-YGR, September 17, 2020, United States District Court Northern District of California Oakland Division (hereafter “Consumers’ Complaint”), at ¶ 4.

²⁷ Consumers’ Complaint, at ¶ 5.

²⁸ Consumers’ Complaint, at 19.

²⁹ Donald R. Cameron, et al. v. Apple Inc., Developer Plaintiffs’ Motion for Class Certification, No. 4:19-cv-03074-YGR, June 1, 2021, United States District Court Northern District of California Oakland Division (hereafter “Developers’ Class Certification Motion”), at 1.

exercises monopoly (or monopsony) power within that market; whether Apple has engaged in anticompetitive conduct; and whether putative Class members can demonstrate and quantify classwide impact and damages resulting from Apple's conduct."³⁰

38. Likewise, the Consumers filed a motion in which they seek to have the Court certify a class consisting of "All persons in the United States, exclusive of Apple and its employees, agents and affiliates, and the Court and its employees, who purchased one or more iOS apps or app licenses from Apple, or who paid Apple for one or more in-app purchases, including, but not limited to, any subscription purchase, for use on an iOS Device at any time since July 10, 2008."³¹ This class certification motion claims that "Class members share many common questions of law and fact. The overwhelming predominant common questions in this case include: (1) whether the aftermarket for iOS apps and IAP is a relevant market and whether Apple has power in that market; (2) whether Apple willfully acquired or maintained monopoly power in that market; (3) whether Apple has engaged in anticompetitive conduct; (4) whether Apple's monopoly has caused antitrust injury to Plaintiffs and all other members of the Class; and (5) if so, what measure of damages is proper."³²

III.D. Overview of Certain of Plaintiffs' Experts' Opinions

39. In support of their motion for class certification, the Developers filed the Expert Class Certification Report of Professor Einer Elhauge (the "Elhauge Report") and the Expert Class Certification Report of Professor Nicholas Economides (the "Economides Report"). Likewise, the Consumers have filed the Expert Report of Daniel L. McFadden in Support of Plaintiffs' Motion for Class Certification (the "McFadden Report"). Below I summarize specific aspects of these reports that are relevant to my assignment.

III.D.1. Professors Elhauge and Economides

40. Professor Elhauge purports to "evaluate Apple's market shares and market power in a number of potentially relevant markets" such as "the U.S. market for iOS app and digital IAP distribution services," the "U.S. smartphone and tablet markets," and "all app and digital IAP distribution services on mobile devices."³³ He concludes that "the relevant product market in this case is the market for iOS app and digital in-app-purchase (IAP) distribution services."³⁴
41. Professor Elhauge claims that "[c]luster market principles do not apply to the iOS app distribution market because all of the products in this market (the two-sided App Store

³⁰ Developers' Class Certification Motion, at 2.

³¹ In re Apple iPhone Antitrust Litigation, Plaintiffs' Notice of Motion and Motion for Class Certification; Memorandum of Points and Authorities, at Memorandum of Points and Authorities, No. 4:11-cv-06714-YGR, June 1, 2021, United States District Court Northern District of California Oakland Division (hereafter "Consumers' Class Certification Motion"), at 2.

³² Consumers' Class Certification Motion, at 2.

³³ Expert Class Certification Report of Professor Einer Elhauge, June 1, 2021 (hereafter "Elhauge Report"), at ¶ 7.

³⁴ Elhauge Report, at ¶ 3.

platform, rival two-sided iOS app distribution platforms, and direct distribution of native iOS apps) are all direct substitutes for each other.”³⁵

42. Professor Elhauge claims the “Hypothetical Monopolist test shows that the iOS app distribution market ... is sufficiently broad” because “Apple’s commissions in the actual world ... have been far more than 5% higher than the prices that (i) have prevailed in more competitive app distribution markets or (ii) would have prevailed in the iOS app distribution market without Apple’s anticompetitive conduct”³⁶ He further claims that this conclusion is supported by “Apple’s extraordinarily high profit margins” which “provide direct evidence that, as a near-100% monopolist, Apple has exercised a power to raise prices far more than 5% above competitive levels.”³⁷
43. Professor Elhauge analyzes “iOS [a]pp [d]istribution as an [a]ftermarket” and concludes that “evidence common to the class indicates that competition in the primary mobile device market does not significantly constrain Apple’s market power in the secondary iOS app distribution market.”³⁸
44. Professor Elhauge opines that “[t]he relevant geographic market for this case is the United States.”³⁹
45. Based on this market definition, Professor Elhauge opines that “Apple has had a near-100% market share in the U.S. market for iOS app and digital IAP distribution services.”⁴⁰
46. Professor Economides relies on Professor Elhauge’s market-definition opinions.⁴¹

III.D.2. Professor McFadden

47. Professor McFadden characterizes Apple as “a retailer that sells iOS apps and in-app content” and app developers as “suppliers that ‘manufacture’ apps and in-app content

³⁵ Elhauge Report, at ¶ 167.

³⁶ Elhauge Report, at ¶ 4.

³⁷ Elhauge Report, at ¶ 4.

³⁸ Elhauge Report, at section II.E header and ¶ 216.

³⁹ Elhauge Report, at ¶ 3.

⁴⁰ Elhauge Report, at ¶ 7.

⁴¹ Expert Class Certification Report of Professor Nicholas Economides, June 1, 2021 (hereafter “Economides Report”), at ¶ 10. (“I understand that Prof. Elhauge has opined that the relevant market in this case is the market for domestic iOS app and digital in-app-purchase (IAP) distribution services, including all the ways that developers can distribute native apps to users of iOS devices in the United States. For the purposes of brevity, throughout this report I will refer to the market as the ‘iOS app distribution’ market, but I mean this term to include initial purchases, subscriptions, and IAP. I have read his market definition analysis and find that his conclusions are sound.”) See also Zoom Deposition of Nicholas Economides, August 4, 2021 (hereafter “Economides Deposition”), at 92:2 – 92:7 (Q: “So you’re making a substantive statement there that you believe Professor Elhauge’s conclusions about the relevant market are sound, correct?” A: “Correct.”).

and supply them through Apple.”⁴² Professor McFadden characterizes the price the developer receives as a “wholesale price.”^{43,44}

48. Professor McFadden opines that “there exists a relevant antitrust market for selling consumers iOS apps and in-app content, which are relevant products in this market.”⁴⁵
49. Professor McFadden further asserts that (a) “[t]he relevant iOS apps and in-app content market is commonly referred to as an ‘aftermarket’”⁴⁶ and (b) “[i]n the primary market, consumers choose OS installed mobile devices such as iOS mobile devices or Android mobile devices.”^{47,48}
50. Based on this market definition, Professor McFadden opines that “Common Evidence Supports the Conclusion that Apple’s Share in the iOS Aftermarket is Almost 100 Percent.”⁴⁹

⁴² Expert Report of Daniel L. McFadden in Support of Plaintiffs’ Motion for Class Certification, June 1, 2021 (hereafter “McFadden Report”), at ¶ 42.

⁴³ “Apple, as the retailer, sets the App Store commission, which when paid by developers leads to the determination of the retail prices paid by consumers and the wholesale prices received by developers.” (McFadden Report, at ¶ 42.) See also Zoom Deposition of Daniel McFadden, Ph.D., August 3, 2021 (hereafter “McFadden Deposition”), at 31:10 – 31:21 (Q: “Have you defined a relevant wholesale market in this case?” A: “I have not specifically defined a – a wholesale market, but using the terminology that I have used and – and – which is that the Apple Store is an intermediary retailer and distributor. The – the relationship between the Apple Store and the developer is – is a wholesale market relationship, and the relationship between the App Store and consumers is a retail market relationship, and those two markets are bound – closely together.”).

⁴⁴ In contrast to Professor McFadden characterizing the relationship between Apple and a developer as one between a retailer and a manufacturer charging a wholesale price, I note that Apple is instead in an agency relationship with developers. It is the developer, not Apple, who chooses the retail price paid by consumers. See DPLA, Schedule 2, APL_APPSTORE_10137343–388, (a) at ¶ 1.1, at 43 (“You hereby appoint Apple ... as: (i) Your agent for the marketing and delivery of the Licensed Applications to End-Users...”; (b) *ibid.*, Exhibit A, § 1 at 76 (“You appoint Apple Inc. as Your agent pursuant to California Civil Code §§ 2295 et seq. for the marketing and End-User download of the Custom Applications by End-Users located in the following country: United States.”); (c) *ibid.*, at ¶ 4.1, at 49 (“The parties acknowledge and agree that Apple shall not acquire any ownership interest in or to any of the Licensed Applications or Licensed Application Information, and title, risk of loss, responsibility for, and control over the Licensed Applications shall, at all times, remain with You.”); and (d) *ibid.*, at ¶ 3.1 (“All of the Licensed Applications shall be marketed by Apple, on Your behalf, to End-Users at prices identified in a price tier and *designated by You, in Your sole discretion*, from the pricing schedule attached to this Schedule 2 as Exhibit C, which may be updated from time to time by Apple on App Store Connect. In addition, You may, at Your election via App Store Connect, instruct Apple to market the Licensed Applications at a discount of 50% of Your established price tier for authorized institutional customers. *You may change the price tier for any Licensed Application at any time, at Your discretion*, in accordance with the pricing schedule set forth on that Exhibit C....” Emphases added.)

⁴⁵ McFadden Report, at ¶ 42.

⁴⁶ McFadden Report, at ¶ 43.

⁴⁷ McFadden Report, at ¶ 44. See also Zoom Deposition of Daniel McFadden, Ph.D., August 3, 2021, at 38:8 – 38:10 (Q: “In your opinion, the relevant market is an aftermarket; is that – is that correct?” A: “Yes.”).

⁴⁸ The Consumers’ Complaint states that “[t]he aftermarket for iOS applications includes the market for distributing software applications that can be downloaded on iOS Devices ... and also includes the market for in-app purchases for iOS Devices....” (Consumers’ Complaint, at ¶ 76.)

⁴⁹ McFadden Report, at section IV.B.1.

IV. An Overview of Market-Definition Methodology

51. The delineation of one or more relevant markets is an important tool for assessing issues concerning competition and antitrust. Properly defined relevant markets facilitate the analyses of products, services, suppliers, and platforms that place significant competitive constraints on the challenged behavior of a firm. Such a competitive constraint often takes the form of a customer's ability to substitute to a different product or service. Hence market definition focuses on demand substitution. The suppliers who can satisfy those demands are the participants in the relevant market.
52. Because the definition of relevant markets addresses competitive constraints on the challenged behavior of a firm, the identification of the relevant market is not just a function of the defendant's industry or product; it must be specific to the allegations and theory of harm.
53. Delineating the relevant market(s) is frequently the first step in the process of determining whether a firm possesses significant market power. This market-power inquiry is a critical threshold step—a screen—in determining whether challenged business practices of that firm are anticompetitive.
54. In its role in the analysis of market power, product market definition asks: to what products or services would customers be able and willing to turn if the prices of the relevant products/services increased (or their qualities decreased)? Thus, market definition focuses on demand substitution to identify a set of “reasonably interchangeable” products. This fundamental precept is set out plainly in the U.S. antitrust agencies' Horizontal Merger Guidelines.⁵⁰ While the Horizontal Merger Guidelines directly address methodologies and standards for the analysis of horizontal mergers, analytic practices concerning other antitrust issues commonly and appropriately draw on their content. This is particularly the case for market definition and for the Hypothetical Monopolist Test and other techniques for market definition explicated in the Horizontal Merger Guidelines. These have officially been adopted for the U.S. antitrust agencies' analyses of vertical mergers,⁵¹ and they are also the standard of analysis for issues that arise in the context of concerns over monopolization, with variations as appropriate.

⁵⁰ “Horizontal Merger Guidelines,” U.S. Department of Justice and the Federal Trade Commission, August 19, 2010 (hereafter “Horizontal Merger Guidelines”), at (a) § 4 (“Market definition focuses solely on demand substitution factors, i.e., on customers' ability and willingness to substitute away from one product to another in response to a price increase or a corresponding non-price change such as a reduction in product quality or service.”) and (b) § 4.1.1 (“The Agencies use the hypothetical monopolist test to identify a set of products that are reasonably interchangeable with a product sold by one of the merging firms.”).

⁵¹ See, e.g., Vertical Merger Guidelines, U.S. Department of Justice and the Federal Trade Commission, June 30, 2020, <https://www.justice.gov/atr/page/file/1290686/download>, at page 3. (“In any merger enforcement action involving a vertical merger, the Agencies will normally identify one or more relevant markets in which the merger may substantially lessen competition. Many of the general purposes and limitations of market definition described in Section 4 of the Horizontal Merger Guidelines are also relevant when the Agencies define markets for vertical mergers, and the Agencies generally use the methodology set forth in Sections 4.1 and 4.2 of the Horizontal Merger Guidelines to define relevant markets for vertical mergers.”)

55. For example, since the Horizontal Merger Guidelines and its Hypothetical Monopolist Test (“HMT”) are structured to answer the *prospective* question of whether a proposed *merger* would cause prices to rise, a variation must be adopted to assess whether current prices reflect an increase caused by an alleged monopolization that has already occurred.⁵² Backwards-looking variants of the HMT require a specification of the “competitive price” that would hold absent the alleged monopolization.^{53,54} The results of this type of HMT are extremely sensitive to the determination of that “competitive price.”⁵⁵ In practice, particularly with insufficient data and/or a poorly formulated but-for world, this approach runs the risk that the outcome will merely reflect embedded assumptions that essentially assume the answer to the ultimate inquiry.
56. When the needed fine-grained demand data are available (and reflect sufficient price variation to permit the reliable estimation of demand), the HMT can be employed quantitatively to inform the definition of a relevant market.⁵⁶ When such fully detailed data are not available, the principles of the HMT can nevertheless be employed to guide the utilization of whatever information is available.
57. When the HMT cannot be employed quantitatively due to the absence of the needed reliable data, the “reasonably interchangeable” criterion can be implemented qualitatively to inform the delineation of relevant markets.⁵⁷ Although “reasonably interchangeable” is a less precise and more qualitative concept, it comes by its imprecision honestly—acknowledging the lack of data and/or historical price variability that would allow more quantitative methodologies. On the other hand, HMTs that rely on arbitrary, assumption-driven specifications of a but-for price can give the illusion of high-precision

⁵² See, e.g., Lawrence J. White, “Market Power and Market Definition in Monopolization Cases,” in *Issues in Competition Law and Policy*, Volume II, 2008, 913–924 (hereafter “White (2008)”), at 917. (“[T]he *Merger Guidelines* SSNIP inquiry is sensibly used only in the context of a *forward-looking* question: Will this merger permit the creation or enhancement of market power?” Italics in original.)

⁵³ White (2008), at 919. (“What other tests might be possible? First, if the competitive price were known, then that price might be used as a benchmark for judging whether an alleged monopolist is exercising market power.”)

⁵⁴ See Philip B. Nelson and Lawrence J. White, “Market Definition and the Identification of Market Power in Monopolization Cases: A Critique and a Proposal,” NYU Libraries Faculty Digital Archive, November 17, 2003, (hereafter “Nelson and White (2003)”), <<http://archive.nyu.edu/handle/2451/26179>>, accessed on August 4, 2021. (“[W]e propose asking the following question in monopolization cases where exclusionary practices are alleged: Would preservation of the allegedly foreclosed competitor or group of competitors have led to a small but significant nontransitory *decrease* in price (SSNDP) by the defendant?” Italics in original.)

⁵⁵ Referring to the SSNDP test of Nelson and White (2003), White (2008), at 923, states: “This test requires considerable care and qualification, including a two-step construction of the ‘but for’ counterfactual: (1) What would the plaintiff’s sales have been in the absence of the defendant’s exclusionary action? and (2) What would have been the consequences for the defendant’s price?”

⁵⁶ See, e.g., Horizontal Merger Guidelines, at § 4.1.1.

⁵⁷ See also Janusz A. Ordover and Robert D. Willig, “The 1982 Department of Justice Merger Guidelines: An Economic Assessment,” *California Law Review*, 71, 1983, 535–574, at 541. (“The Guidelines do not remove all foibles and elements of subjectivity from the market definition process. This is the case for several reasons. First and most obviously, the needed fine-grained demand data may be unavailable to perform rigorously the 5% tests of sales diversion called for by the Guidelines. Then, the analyst will have to rely on less precise criteria such as those set forth in the [1982] Guidelines.”)

quantitative analyses, yet are unreliable because the test is not rigorously tethered to economic realities.⁵⁸

58. In my experience, economists, antitrust enforcement agencies, and courts do not delineate relevant markets mechanically by treating the HMT as if it were a cookbook recipe. Instead, when done reliably, relevant markets are delineated as groups of products or services that reflect the market realities of demand substitution opportunities, as evidenced by market information and experiences of market participants, and guided by the principles of the HMT.
59. Market definition ultimately should reflect best pertinent evidence, both quantitative and qualitative. Market delineation can be informed by whether the industry or the public recognizes a set of products or services as a meaningful economic grouping, the unique ways in which the products or services are used, how they are produced, who their customers are, and whether they are sold through specialized vendors. Such evidence can be indicative of substitution opportunities and realities.
60. When the HMT is used, it does not deterministically define a relevant market. As stated in the Horizontal Merger Guidelines: “[The HMT] does not lead to a single relevant market. The Agencies may evaluate a merger in any relevant market satisfying the test, guided by the overarching principle that the purpose of defining the market and measuring market shares is to illuminate the evaluation of competitive effects.”⁵⁹
61. If (a) the relevant market in which the challenged practices occur is robustly competitive, or (b) the challenged firm itself does not have (and is unlikely to acquire) significant market power in the relevant market or (c) the challenged practices are not a cause of whatever market power the challenged firm has, it is warranted to conclude that the challenged practices are not anticompetitive.
62. If these conditions fail to hold, the inquiry regarding effects of the challenged practices on competition continues. In any case, if the challenged practices do not significantly diminish the strength of the competitive process in the relevant market, it is warranted to conclude that those practices are not anticompetitive.
63. In addition to its role in questions of market power, the delineation of the relevant market informs analyses of anticompetitive effects, business justifications, antitrust injury, and damages.
64. Antitrust analysis may go dangerously astray if it is conducted within the confines of a purported relevant market that is misdrawn, whether too narrowly, too broadly, or a combination of both. If too narrow, the purported relevant market could omit significant market forces and sources of competitive discipline. If too broad, the analysis risks, among other things, conflating into a single market products and services that in

⁵⁸ I note that Professor Elhauge states that “[t]he Hypothetical Monopolist Test thus functionally provides a precise, objective, and quantitatively measurable definition of which potential substitutes are ‘reasonably interchangeable’ with the defendant’s product at issue.” (Elhauge Report, at ¶ 34.) However, his HMT is driven by assumptions of the but-for commission that are unreliable. See section VI.D below.

⁵⁹ Horizontal Merger Guidelines, at § 4.1.1. (“The hypothetical monopolist test ensures that markets are not defined too narrowly, but it does not lead to a single relevant market.”)

fact represent very different competitive circumstances and impacts, and thus require instead analysis in multiple, more refined markets.

65. As I explain below, Plaintiffs' experts' market definition makes both the too-narrow and too-broad errors simultaneously: their market definition is too narrow in that it focuses on only iOS platforms and it is too broad in that it aggregates all app transactions into a single relevant market.

V. The App Store Is a Two-Sided Transaction Platform, Both Sides of Which Must Be Included in the Relevant Market

66. Professor Schmalensee's report discusses in detail two-sided platforms, indirect network effects, and that transaction platforms are a special case of two-sided platforms.⁶⁰ Professor Schmalensee's report also discusses Apple's business model for its App Store to demonstrate that the App Store is a two-sided transaction platform.⁶¹
67. Professor Elhauge acknowledges that app distributors generally, and thus the App Store in particular, are two-sided transaction platforms.⁶² Professor Economides concurs.^{63,64}
68. Professor McFadden's market definition adopts the paradigm of a one-sided retailer,⁶⁵ which does not appear to take into account the interdependence of the two groups of customers—consumers and developers—served by the App Store.⁶⁶
69. A two-sided transaction platform facilitates transactions between two distinct groups of customers—in this case, app developers and app users. The demand of customers on one side of the platform creates a “network externality” for those customers on the other

⁶⁰ Expert Declaration of Richard Schmalensee, Ph.D., August 10, 2021, at § VII.A and § VII.B.

⁶¹ Id., at § VII.C and § VII.D.

⁶² Elhauge Report, at ¶ 40. (“App distributors are two-sided transaction platforms....”) See also Zoom Deposition of Einer Elhauge, July 30, 2021 (hereafter “Elhauge Deposition”), at 56:3 – 56:10. (Q: “All right. Professor, you agree that the App Store is a two-sided platform, right?” A: “Yes.” Q: “And you agree that the relevant market at issue here in this case is a two-sided market, right?” A: “Yes.”)

⁶³ Economides Report, at ¶ 42. (“Apple's App Store is a two-sided platform, which must balance the needs of users on both sides of the platform, that is of app developers and users.”)

⁶⁴ I note that, in *Epic v. Apple*, Epic's expert Dr. David Evans also acknowledged that app stores in general, and the App Store in particular, are two-sided transaction platforms. See, e.g., Expert Report of David S. Evans, Epic Games, Inc., v. Apple Inc., February 15, 2021 at (a) ¶ 141 (“Personal computer operating systems, and application stores that operate as online marketplaces ... are both two-sided platforms with significant positive indirect network effects, and they are both transaction platforms as that term is used by economists.”); (b) ¶ 242 (“App stores are typically operated as online marketplaces, which are two-sided platforms. To operate an online marketplace, app stores need to compete for both groups simultaneously because users want to be able to get apps from the store and developers want stores that have customers. They are also transaction platforms as that term is used by economists.” Internal footnotes removed.); and (c) footnote 797 (“Like the App Store these online marketplaces are also transaction platforms.”).

⁶⁵ McFadden Report, at ¶ 42. (“Consumers who have iOS mobile devices ... are consumers of this market, Apple is a retailer that sells iOS apps and in-app content, and app developers are suppliers that ‘manufacture’ apps and in-app content and supply them through Apple. Apple, as the retailer, sets the App Store commission, which when paid by developers leads to the determination of the retail prices paid by consumers and the wholesale prices received by developers.”)

⁶⁶ See section V, where I explain the need to take both sides into account in market definition in the context of two-sided app transaction platforms.

side: The value that customers on one side gain from their participation in the two-sided platform increases with (a) the number of customers on the other side and (b) the intensity of usage of the platform by customers on the other side.

70. The transaction platform owner, in order to maximize its profit and the value of the platform, must carefully balance the prices and other terms that apply to the customers on each side. A change meant to encourage greater participation on one side can have the effect of discouraging participation on the other. Because the relevant product is a transaction, excess demand on one side (i.e., more willingness to transact on one side than on the other) is squandered because transactions will be consummated only to the extent the levels of willingness to transact on the two sides are in balance.
71. The two-sidedness of a transaction platform must inform the definition of any relevant market in which that platform competes. In particular, because of the linkages between the two groups of customers, any changes in price or other terms by the platform owner toward the customers on one side can affect the demand for the platform's services from customers on the other side. The reactions of the customers on the other side can have a disciplining effect on the platform owner.
72. As I explained in section IV, the relevant market must include the sources of the competitive constraints on the challenged behavior of a firm. Thus, because each side of the two-sided transaction platform influences the impact on the platform of actions targeted at the other side, delineating the relevant market for a two-sided app transaction platform must include analysis of both sides of the platform—here, the app developers and app consumers—and evaluation of the demand substitution opportunities of each.⁶⁷
73. Restricting attention to the customers on only one side of the transaction platform would render the resulting market definition unreliable because its scope would exclude a significant competitive constraint, viz., the customers on the omitted side of the platform. Although the one-sided approach could incorporate the initial, direct response of that side, the analysis would be prematurely truncated and miss the follow-on indirect effect from the excluded side.⁶⁸

⁶⁷ To say that (a) a relevant market in which a two-sided transaction platform competes must span both sides of the platform is *not* to say that (b) a two-sided transaction platform necessarily competes in exactly one relevant market. To the extent that Professor Elhauge is asserting the latter, he is misinterpreting the literature. See Elhauge Report, at ¶ 42. (“Because app distribution is a two-sided transaction platform, *only* one market should be defined encompassing both sides of the platform. Thus, one should define the market in which the App Store competes as a *single* two-sided market that includes both the developer side and the consumer side (rather than defining separate markets for each side).” Emphasis added.) Professor Elhauge cites to two papers—see Elhauge Report, footnote 33—both of which stand for the proposition that any relevant market for a transaction platform must include both sides of the platform. Neither paper explores or considers whether all of the platform's transactions should be clustered together in a single two-sided relevant market. See section VI, where I analyze this question.

⁶⁸ See, e.g., Lapo Filistrucchi, Damien Geradin, Eric van Damme, and Pauline Affeldt, “Market Definition in Two-Sided Markets: Theory and Practice,” *Journal of Competition Law & Economics*, 10(2), 2014, 293–339, at 330–331. (“Considering a two-sided platform with sides *A* and *B* linked by positive indirect network effects, the application of a one-sided SSNIP test on side *A* would only account for the direct effect that a price increase will have on the demand and profits of side *A*. It will not account for the fact that a reduction of the number of customers on side *A* is likely to lead to a reduction of the number of customers on side *B* such that, if the price on side *B* is kept constant, there would be a loss in profits also on side *B*. It would also

74. As an example from the payment card industry, suppose the Discover credit card network were to contemplate an increase in the transaction fees it charges merchants. The direct effect of such an increase would likely be that some marginal merchants (i.e., Discover-accepting merchants that were close to indifferent between accepting and not accepting Discover) would choose to drop their acceptance of Discover cards. This would cause Discover to lose the charge volume at those no-longer-accepting merchants and to lose the profit margin associated with that charge volume. On the other hand, Discover's margin on the charge volume at all merchants that continued to accept Discover would increase.
75. In calculating only the direct effect of the contemplated fee increase, Discover would weigh (a) the loss in profit associated with the lost charge volume at no-longer-accepting merchants against (b) the increased profit at remaining Discover-accepting merchants. If Discover were to forecast the direct loss to be smaller in magnitude than the direct gain, this partial, truncated analysis would suggest that the fee increase would be profitable for Discover.
76. But that analysis would be unreliable because it leaves out the concomitant indirect effect of Discover's merchant-fee increase on the consumers that carry Discover cards. These consumers carry and present Discover cards because those cards are accepted at many merchants. The fewer merchants that carry Discover, the smaller a consumer's incentive to carry a Discover card. The increase in Discover's merchant fees would cause some marginal merchants to stop accepting Discover and this decrease in merchant coverage would cause some marginal Discover-carrying consumers to either cancel or stop carrying their Discover cards altogether or to be less likely to present those cards for payment at the remaining Discover-accepting merchants. This would cause Discover to lose additional charge volume, and its associated profit, from transactions at merchants that *did* acquiesce to the fee increase. Incorporating this indirect negative effect on Discover's profit from the contemplated fee increase could reverse a favorable conclusion reached after the truncated, one-sided analysis. In other words, the loss of profit from the direct and indirect effects combined could be greater in magnitude than the increase in profit margin at the inframarginal merchants and, thus, the contemplated fee increase would be unprofitable rather than profitable.
77. The prospect that incorporating the indirect effects of a platform's action would be pivotal in determining whether that action is optimal for the platform warrants requiring the incorporation of both sides of the platform in such an analysis.
78. This initial added layer of incorporating indirect effects on consumers of a fee hike to merchants does not, however, exhaust the indirect effects that need to be considered. The consumers that stop using, or reduce their use of, Discover cards would negatively affect the remaining Discover-accepting merchants' incentives to continue accepting. If, as a result, more merchants were to stop accepting Discover, then additional consumers

not envisage the fact that the smaller number of customers on side *B* will in turn reduce the demand of side *A*, and so on. Hence, it would also underestimate the loss in profits on side *A*.”)

would stop using, or further reduce their use of, Discover cards, etc., and this process could result in a downward spiral.⁶⁹

79. Thus, a one-sided approach to market definition in the context of two-sided transaction platforms will tend to understate the disincentive to a platform from raising price or otherwise disadvantaging one side. This understatement then results in a bias towards an overly narrow relevant market because the HMT's analytic process would end prematurely.⁷⁰

VI. Plaintiffs' Experts Are Incorrect to Cluster All iOS App Transactions into a Single Relevant Market

VI.A. Products that are not close substitutes can sometimes be aggregated into a "cluster market" for analytical convenience, but only when the competitive conditions under which the constituent products are sold are sufficiently similar

80. As I explained in section IV, a relevant product market contains only products that are reasonably interchangeable, i.e., products that are substitutes for one another.
81. Nevertheless, it is sometimes valid and convenient to group numerous non-substitutes into a single "cluster market," but only when the competitive conditions for each product in the cluster are the same.^{71,72}
82. For example, in connection with the Federal Trade Commission's challenge of the proposed merger of Staples and Office Depot, Professor Shapiro explained the use of a cluster market in that case.⁷³ First, Professor Shapiro observed that "[v]irtually each type

⁶⁹ The Supreme Court took note of this economic principle about two-sided transaction markets in *Ohio, et al. v. American Express Co.*, et al., 138 S. Ct. 2274 2018 (hereafter "Ohio v. Amex"). ("Two-sided platforms must take these effects into account before making a change in price on either side, or they risk creating a feedback loop of declining demand.")

⁷⁰ See also Lapo Filistrucchi, Damien Geradin, Eric van Damme, and Pauline Affeldt, "Market Definition in Two-Sided Markets: Theory and Practice," *Journal of Competition Law & Economics*, 10(2), 2014, 293–339, at 331. ("Positive indirect network effects between the different sides of the platform reduce the profitability of any price increase. As there is always at least one positive indirect network effect, the risk of applying a standard SSNIP test, which does not account for feedback effects, is that in such cases the market will be defined too narrowly.")

⁷¹ See, e.g., ABA, *Market Power Handbook: Competition Law and Economic Foundations*, 2005, at 112. ("[C]ommentators and economists criticize the cluster approach as inconsistent with the demand-side focus of market definition. Nonetheless, some critics acknowledge that cluster markets can be used for convenience when market participants, concentration and entry conditions are similar across the product markets so that the competitive effects analysis for each market would likely be consistent.")

⁷² See, e.g., Jonathan B. Baker, "Market Definition: An Analytical Overview," *Antitrust Law Journal*, 74, 2007, 129–173, at 158. (A cluster market "can be defended as a matter of analytical convenience: there is no need to define separate markets for a large number of individual hospital services, for example, when market shares and entry conditions are similar for each, or when data limitations will effectively require that the same proxy (such as the number of hospital beds) be employed to estimate the market share for each individual service.")

⁷³ Professor Carl Shapiro, "Staples-Office Depot Merger Analysis," Charles River Associates, April 7, 2016, redacted public version, Case 1:15-cv-02115-EGS, PX06500-001 – 082 (hereafter "Shapiro Testimony"),

of product is a distinct relevant market [because they are] [n]ot functionally interchangeable,” giving the example of pens and binders. There are thousands of SKUs purchased by large customers.⁷⁴ Professor Shapiro noted that is “[i]mpractical to analyze each separately.” However, “[i]f competitive conditions are similar across different product types, [it is] [a]ppropriate to use [a] cluster market [to] [a]ggregate distinct product markets into a single market for purposes of competitive analysis.”^{75,76}

83. While the cluster market in the Staples/Office Depot case included most products sold by the two firms because those products faced similar competitive conditions, the court excluded ink and toner because of the different competitive conditions defining sales of those products.⁷⁷ Specifically, the court found that large business customers purchased ink and toner from not only office supply stores like Staples and Office Depot, but also from printer and copier manufacturers pursuant to certain contractual arrangements in which customers purchased printers and copiers together with maintenance services and ink and toner.⁷⁸ Since printer and copier manufacturers that sold ink and toner did not sell other office products, like pens and binders, ink and toner sales were determined not to face the same set of competitive conditions and were excluded from the cluster market.⁷⁹
84. In summary, a cluster market is valid only when there is a basis to know—prior to performing the cluster-market analysis—that separate analyses of each of the clustered products would arrive at the same answer as that obtained for the cluster.
85. A proposed cluster market is *not* valid if it combines products that are not substitutable for each other and that face different competitive conditions. In particular, a proposed

at 014,

<https://www.ftc.gov/system/files/documents/cases/170216staples_redacted_shapiro_demonstrative.pdf>, accessed on August 4, 2021.

⁷⁴ Shapiro Testimony, at 015.

⁷⁵ Shapiro Testimony, at 014.

⁷⁶ See also *FTC, et al. v. Staples, Inc., et al.*, 190 F. Supp. 3d 100, 2016, United States District Court, District of Columbia (hereafter “*FTC v. Staples*”), citing the expert report of Carl Shapiro. (“Although a pen is not a functional substitute for a paperclip, it is possible to cluster consumable office supplies into one market for analytical convenience. ... Defining the market as a cluster market is justified in this case because ‘market shares and competitive conditions are likely to be similar for the distribution of pens to large customers and the distribution of binder clips to large customers.’ Shapiro Report at 007.”)

⁷⁷ *Federal Trade Commission v. Staples, Inc.*, 190 F. Supp. 3d 100, May 10, 2016, United States District Court District of Columbia, <<https://casetext.com/case/fed-trade-commn-v-staples-inc-4>>, accessed on August 9, 2021 (hereafter “*Federal Trade Commission v. Staples, Inc.*”), at 123–125. (“Defendants’ argument for inclusion of ink and toner fails because they are not subject to the same competitive conditions as general office supplies.”)

⁷⁸ *Federal Trade Commission v. Staples, Inc.*, at 123. (“Competition for the sale of ink and toner has increased due to the ‘recent and rapid’ rise of Managed Print Services (‘MPS’). ... MPS vendors like Xerox, Hewlett-Packard, Lexmark, and Ricoh provide a bundle of services that includes sale of ink and toner in addition to service and maintenance of printers and copiers. ... There is ample record evidence to show that ink, toner, and other adjacent BOSS items are properly excluded from the relevant market because they are subject to distinct competitive conditions. For example, some large companies are shifting all of their ink and toner business to an MPS.”)

⁷⁹ Krishna A. Cerilli, “Staples/Office Depot: Clarifying Cluster Markets,” *Competition Policy International*, August 15, 2016, 1–10, at 5. (“Those printer and copier manufacturers generally did not sell other consumable office products. As such, ink and toner failed the similar competitive conditions test for inclusion in the proposed cluster market.”)

cluster market is not valid if it combines non-substitutes that are provided by materially different sets of alternative suppliers.

86. As I explain below, this is the case for Plaintiffs' experts' purported market for iOS app transactions. iOS app transactions cannot be clustered into a single market because different app transactions face substantially different competitive conditions.

VI.B. Plaintiffs' experts fail to perform any reliable analysis to support their claim that all iOS apps can be clustered in the same relevant antitrust market

87. Although Plaintiffs' experts aggregate all iOS transactions together into a single relevant market, none of them has performed any analysis that demonstrates that all iOS app transactions face the same competitive conditions such that they can be properly clustered together. The failure of their analyses to address this issue renders their market definition opinions unreliable.
88. In fact, Professor McFadden does not mention cluster markets at all in his report. Professor Elhauge wrongly asserts that “[c]luster market principles do not apply to the iOS app distribution market because all of the products in this market (the two-sided App Store platform, rival two-sided iOS app distribution platforms, and direct distribution of native iOS apps) are all direct substitutes for each other.”⁸⁰ Professor Elhauge completely ignores the substitutes for iOS app transactions on other non-iOS platforms, such as alternative game app transaction platforms or the alternative streaming video app transaction platforms, which demonstrate that—at the very least—competitive conditions are different for game app transactions and streaming video app transactions, let alone other types of app transactions.
89. Indeed, as I explain in section VII.A.1, game app transactions face competitive conditions—for both the developers of games and for the consumers that play games—that are demonstrably different from the competitive conditions faced by other, non-game app transactions. I do not offer the illustration of game app transactions to exhaust the set of app transactions that face differently situated competitive conditions; rather I offer game app transactions as a single example of this, albeit a very material one. The fact that game transactions face different competitive conditions than non-game app transactions makes it inappropriate to combine (a) transactions for game apps and (b) transactions for non-game apps into a single relevant market. That Plaintiffs' experts have done so renders their market definition opinions unreliable.

VI.C. Professor Elhauge's four step argument that there is a single relevant market is not economically sound

90. Professor Elhauge argues that all app transactions (including game and non-game transactions) must be included in the same relevant market—regardless of differences in the competitive circumstances between different types of app transactions. In doing so, he ignores a basic principle of market definition and misapplies the concept of a price-discrimination market under the Horizontal Merger Guidelines.

⁸⁰ Elhauge Report, at ¶ 167.

91. Professor Elhauge's argument has four steps:

- 1) Professor Elhauge claims that "[c]luster market principles do not apply to the iOS app distribution market because all of the products in this market (the two-sided App Store platform, rival two-sided iOS app distribution platforms, and direct distribution of native iOS apps) are all direct substitutes for each other."⁸¹
- 2) Professor Elhauge claims that "[t]he product—iOS app distribution—is *the same* for every transaction, regardless of genre, even though the apps and in-app products vary between transactions."⁸²
- 3) Because the product, according to Professor Elhauge, is the same for every transaction,⁸³ he asserts that a game transaction and a non-game transaction are different only in the sense that Apple is selling the same product to different customers.⁸⁴ Thus, Professor Elhauge argues, deciding whether these two sets of transactions are in separate markets requires application of what he purports to be a test regarding price-discrimination markets in the Horizontal Merger Guidelines:⁸⁵ that two groups of customers purchasing a common product constitute two separate price-discrimination markets only if only one of the two groups is adversely affected by an alleged loss of competition (i.e., only if one group is *unaffected*).⁸⁶
- 4) Professor Elhauge finds that "[e]liminating competition in the iOS app distribution market has increased commissions for *both* game and non-game transactions." Thus, under his purported test for price-discrimination markets, Professor Elhauge concludes that "there are *not* separate markets for the distribution of games versus non-games."⁸⁷

92. Professor Elhauge's four-step argument is incorrect. It relies upon a totally baseless misinterpretation of the Horizontal Merger Guidelines and their underlying logic. Professor Elhauge's argument crucially relies on his assertion that a price-discrimination

⁸¹ Elhauge Report, at ¶ 167.

⁸² Elhauge Report, at ¶ 152a. Emphasis in original.

⁸³ Elhauge Report, at ¶ 152a. ("The product—iOS app distribution—is *the same* for every transaction, regardless of genre, even though the apps and in-app products vary between transactions." Emphasis in original.)

⁸⁴ Elhauge Report, at ¶ 152b. ("To determine whether two groups of customers buying the same product are in two different markets....")

⁸⁵ Elhauge Report, at ¶ 157. ("The Horizontal Merger Guidelines ... explicitly describe the relevant economic test for determining when it is appropriate to define separate markets for two groups of customers purchasing the same product. The Merger Guidelines provide that separate price discrimination markets may be defined around targeted customers if a hypothetical monopolist 'would profitably *and separately* impose at least a SSNIP' on those '*targeted* customers,'" citing Horizontal Merger Guidelines, at § 4.1.4. Emphasis in Elhauge's paragraph.)

⁸⁶ Elhauge Report, at ¶ 157. ("[U]nder this test, the Merger Guidelines provide that one should split a single product into separate markets for different groups of customers only if eliminating competition between sellers of the product would have anticompetitive effects that 'vary significantly for different customers' by 'raising price to certain targeted customers *but not to others*,'" citing Horizontal Merger Guidelines, at § 3. Emphasis in Elhauge's paragraph.) See also *ibid.*, at (a) ¶ 152b ("[T]here are separate markets for the distribution of games versus non-games only if eliminating competition in the iOS app distribution market would increase prices (i.e. commissions) for one group but not the other.") and (b) § 1.E.1.b heading ("One Should Split Two Groups of Customers Buying the Same Product into Separate Price Discrimination Submarkets Only If Eliminating Competition Would Harm One Group But Not The Other").

⁸⁷ Elhauge Report, at ¶ 152c. Emphasis in original.

market can be defined only if one group is unaffected. That is a misportayal of the treatment of price-discrimination markets in the Guidelines. The Guidelines accommodate price discrimination markets where some customers are harmed more than others, not just where some customers are harmed but others are not. This follows from plain logic, but I shall go to the language of the Guidelines and their explications for added support.

93. The Guidelines say:⁸⁸

Product Market Definition with Targeted Customers

If a hypothetical monopolist could profitably target a subset of customers for price increases, the Agencies may identify relevant markets defined around those targeted customers, to whom a hypothetical monopolist would profitably and separately impose at least a SSNIP [small but significant non-transitory increase in price]. Markets to serve targeted customers are also known as price discrimination markets. In practice, the Agencies identify price discrimination markets only where they believe there is a realistic prospect of an adverse competitive effect on a group of targeted customers.

Example 11: Glass containers have many uses. In response to a price increase for glass containers, some users would substitute substantially to plastic or metal containers, but baby food manufacturers would not. If a hypothetical monopolist could price separately and limit arbitrage, baby food manufacturers would be vulnerable to a targeted increase in the price of glass containers. The Agencies could define a distinct market for glass containers used to package baby food.

94. The 1992 version of the Horizontal Merger Guidelines has a fuller articulation saying in § 1.12:⁸⁹

The Agency will consider additional relevant product markets consisting of a particular use or uses by groups of buyers of the product for which a hypothetical monopolist would profitably and separately impose at least a “small but significant and nontransitory” increase in price.

95. Carl Shapiro’s explication of the current (2010) Horizontal Merger Guidelines and the process leading up to them makes this point clearly also:⁹⁰

The revised Guidelines add a separate section on targeted customers and price discrimination. This section sets forth the two basic conditions necessary for price discrimination to be feasible: differential pricing and

⁸⁸ Horizontal Merger Guidelines, at § 4.1.4.

⁸⁹ “1992 Merger Guidelines,” U.S. Department of Justice and Federal Trade Commission, <<https://www.justice.gov/archives/atr/1992-merger-guidelines>>, accessed on August 4, 2021.

⁹⁰ Carl Shapiro, “The 2010 Horizontal Merger Guidelines: From Hedgehog to Fox in Forty Years,” *Antitrust Law Journal*, 77, 2010, 701–759 (hereafter “Shapiro (2010)”), at 745.

limited arbitrage. The basic principles explained here have been well understood by economists for roughly one hundred years. They can be found in the Guidelines going back to 1982 and are not controversial. ...

This new section was placed relatively early in the Guidelines because the basic principles of price discrimination articulated here are used throughout the Guidelines. They are relevant to market definition. For that purpose, we usually are asking whether the hypothetical monopolist can engage in price discrimination.

96. Professor Shapiro further notes that “[i]n keeping with the general style of the Guidelines, the discussion in Section 3 addresses price discrimination, as distinct from discrimination on other dimensions, such as quality or service. This is purely for simplicity of exposition. The same basic principles described in this section also apply to non-price forms of discrimination.”⁹¹
97. In the same presentation, Professor Shapiro asserts directly: “The Guidelines address the danger that mergers may harm some customers more than others, or some customers but not others, usually by making a discriminatory price increase profitable.”⁹² Thus, it is plain from the Horizontal Merger Guidelines that every group of consumers for which a hypothetical monopolist would profitably and separately impose at least a small but significant and nontransitory increase in price can constitute a separate relevant market, especially if the separate pricing to that group is different due to different competitive circumstances for that group’s purchases.
98. Contrary to what Professor Elhauge claims, however, the Horizontal Merger Guidelines do not impose a requirement that, in order for any group of customers to be the subject of a price-discrimination market, only one group of customers can be affected by the challenged behavior.⁹³
99. Professor Elhauge essentially argues that Apple’s current commission rate and policies are the same for all app transactions in the App Store, and therefore a proper relevant market aggregates all these app transactions. There are two issues with this argument. First, the factual predicate that all app transactions are subject to the same commission rate and policies is contradicted by record evidence and the testimony of Professor Hitt who shows that the current pricing by Apple of app transaction services is different for different categories of apps.⁹⁴ This demonstrates that there can be pricing differences for different customers of app transaction services depending on the categories of the apps, so that they do lie in different relevant markets.
100. Second, Professor Elhauge’s argument is contrary to economic logic. His argument requires a showing that (i) the effect of moving from the actual world to the Plaintiffs’

⁹¹ Shapiro (2010), at footnote 146.

⁹² Shapiro (2010), at 746.

⁹³ The Horizontal Merger Guidelines clearly offers the “raising price to certain targeted customers but not to others” as an *example*, not a requirement: “Such differential impacts are possible when sellers can discriminate, e.g., by profitably raising price to certain targeted customers but not to others.” (Horizontal Merger Guidelines, at § 3.)

⁹⁴ Expert Report and Declaration of Lorin Hitt Ph.D., at Figure 27.

assumed but-for world would have common competitive impacts across all app transactions now effected in the App Store, and (ii) in the but-for world the commission policies applicable to all app transactions on iOS would be the same. But, as I explain in section VII, evidence demonstrates that the sources of competition for app transaction services are different for different categories of app transactions, which implies that competitive impacts would not be common across all app transactions.

101. Furthermore, Professor Elhauge does not demonstrate, nor even seem to recognize the need for such, that in the but-for world the commission policies applicable to all app transactions on iOS would be identical. Instead, Professor Elhauge seems to assume that the allegation that Apple's current commission policies are the same for all app transactions in the App Store implies both (i) and (ii) above, but there is no logical validity to that assumption. And it is noteworthy that Professor Elhauge eschews analysis of the competitive forces that have led to Apple's current model.

VI.D. Professor Elhauge's claims regarding his purported Hypothetical Monopolist Test are incorrect and circular

102. Professor Elhauge argues that (i) the Hypothetical Monopolist Test (HMT) proves that the relevant market is no broader than iOS app and IAP distribution services,⁹⁵ and (ii) whether or not this is true is a common issue across the purported class.⁹⁶ His arguments are inaccurately cast, self-contradictory, and completely circular.

VI.D.1. Professor Elhauge's HMT analysis is improperly restricted to average commission rates, which obscures intraclass variation in the difference between actual-world and but-for world commission rates

103. Professor Elhauge maintains that an appropriate use of the HMT compares the current average commissions to what the average commissions would be under what he considers competitive circumstances.⁹⁷ He asserts that, because the pertinent question is

⁹⁵ Elhauge Report, § I.C. heading ("The Hypothetical Monopolist Test Shows That the iOS App Distribution Market is Sufficiently Broad"). See also *ibid.*, at ¶ 28. ("I will sometimes refer to iOS app and digital IAP distribution services as simply 'iOS app distribution'....")

⁹⁶ Elhauge Report, at (a) ¶ 31 ("However one resolves the issues just summarized and further detailed in this Part, those issues are all common to the class because the correct definition of the relevant market is the same for all class members. Further, the methodology, evidence, and analysis used to define the relevant market would be the same even if every class member brought a separate antitrust suit.") and (b) ¶ 107 ("Even if one disputed my conclusion that the Apple's actual commissions for iOS app distribution were at least 5% higher than the commission that would have prevailed in a competitive iOS app distribution market, that issue is by definition common to the class. Resolving the issue depends on evidence of average marketwide commissions, rather than the commissions charged to individual class members, and the answer is the same for all class members because it is a fact about the correct amount of that price difference that is equally true or false for all class members.").

⁹⁷ See, e.g., Elhauge Report, at ¶¶ 104–105, in particular at ¶ 105: "Apple's average commission from the start of the class period (June 4, 2015) to the end of Apple's transaction data (September 2019) was 28.4%. Thus, the relevant question for the Hypothetical Monopolist test here is whether 28.4% is at least 5 percent higher than the commission that would have prevailed if the iOS app distribution market had been competitive." See also *id.*, at (a) ¶ 113 (where Professor Elhauge considers "the weighted average effective commission in the Windows app distribution market"), (b) ¶ 116 (citing Professor Economides for a but-for "average

the comparison of average commissions, that is a classwide question whose commonality supports class certification. That assertion is completely circular. It is circular because to lump all app transactions together to focus on an average commission is to assume that it is appropriate to treat them in common. Professor Elhauge fails to address the primary question, which is whether it is appropriate to treat all app transactions as a singular product. In the context of an application of the HMT, analysis is required to show that a comparison of current commission (and other compensation) arrangements with those that would arguably apply in the so-called but-for world would be the same, or even similar, across the purported class, among the many different kinds of app transactions at issue. In other words, by lumping together all app transactions and looking only at an average commission, Professor Elhauge skips the first, fundamental step of the analysis. In fact, there are many reasons why Plaintiffs would be unable to demonstrate that it is appropriate to lump all iOS app transactions together—for example, see section VII.A, where I explain that different app transaction services can face different competitive circumstances. However, it is most important here to emphasize that Professor Elhauge has not attempted such a demonstration, nor even indicated any awareness that such a demonstration is necessary. In effect, rather than attempt to demonstrate that market definition is indeed a classwide question, Professor Elhauge instead implicitly *assumes* it is so, because otherwise focusing only on averages—which necessarily blur all intraclass differences—would not be justified.

VI.D.2. Professor Elhauge’s HMT improperly considers only one-sided prices rather than two-sided prices

104. Professor Elhauge’s HMT does nothing more than compare the purported average App Store commission rate in the actual world with an average commission he claims would hold in the but-for world, and asks whether the former is five percent higher than the latter.⁹⁸ By focusing exclusively on commission rates when comparing the App Store to other transaction platforms, Professor Elhauge commits the same error that was rejected by the Supreme Court in *Ohio v. Amex*: Professor Elhauge considers only a one-sided price—not a two-sided price.⁹⁹ Professor Elhauge appears to believe, erroneously, that his commission-only price is actually a two-sided price because he notes that Apple and “any of the successful distributors in more competitive benchmarks for app distribution” do not “charge consumers any fees to participate in app distribution platforms.”¹⁰⁰ From

commission rate in the iOS app distribution market”), and (c) ¶ 117 (citing to Dr. Evans for “the App Store’s average commission rate in a competitive but-for world”).

⁹⁸ Elhauge Report, ¶ 104. (“[T]he iOS app distribution market is sufficiently broad if the profit-maximizing price (i.e., commission) of a 100% monopolist in iOS app distribution would be at least 5% higher than the prices (commissions) that would prevail with unrestrained competition in the domestic iOS app distribution market.”)

⁹⁹ *Ohio v. Amex*. (“The plaintiffs have not carried their burden to show anticompetitive effects. Their argument—that Amex’s antisteering provisions increase merchant fees—wrongly focuses on just one side of the market. Evidence of a price increase on one side of a two-sided transaction platform cannot, by itself, demonstrate an anticompetitive exercise of market power.”)

¹⁰⁰ Elhauge Report, at ¶ 110. See also *ibid.*, at (a) ¶ 39 (“During the class period, none of the major app distributors have charged consumers a fee to participate in their platform.”) and (b) ¶ 63 (“The App Store does not charge consumers to participate in its platform; Apple neither requires consumers to pay fixed fees to join the platform nor charges consumers any fees each time they use the platform to obtain an app or purchase a digital in-app product. Nor are consumers charged by any of the other most successful app

this he concludes that “the combined price charged for app distribution to both developers and consumers in a two-sided SSNIP test always simply equals the commission charged to developers.”¹⁰¹

105. However, when looking for whether consumers pay a *positive* price to app stores and coming up empty, he looks in the wrong direction. It is well understood that one side of a transaction platform can be charged a *negative* price in order to induce their participation.¹⁰² Professor Elhauge fails to (a) assess the *benefits* that the App Store, and other purportedly comparable transaction platforms, provide to their consumer sides and (b) account for differences in these benefits across platforms when comparing what should be the platforms’ two-sided prices.
106. For example, one of the services the App Store provides to consumers is the distribution of free apps.¹⁰³ Although both Consumers and Developers have gerrymandered these apps out of their proposed class definitions, the distribution of free apps is a significant benefit to consumers that helps drive them to the App Store,¹⁰⁴ where they can then discover and download Developers’ paid apps and in-app content as well. This is confirmed by the survey results of Professor Itamar Simonson: “One of the findings of Survey 1 was that the number of free apps was an important app store feature for respondents. Survey 4 ... showed that, overall, free apps are about three times more valuable than paid apps....”¹⁰⁵
107. The App Store also provides costly curation services, notably by requiring all apps distributed on the App Store to successfully pass through Apple’s app review screen. Apple’s app review process is designed to make the set of apps available on the App Store safer, more secure, and more user-friendly than they would be without this process.

distributors, including when app distribution is more competitive, as with the distribution of Windows or macOS apps. Thus, consumers do not directly observe or pay a ‘price’ for app distribution.”).

¹⁰¹ Elhauge Report, at ¶ 110.

¹⁰² As the Supreme Court acknowledged, in *Ohio v. Amex*, “Sometimes indirect network effects require two-sided platforms to charge one side much more than the other. ... The optimal price might require charging the side with more elastic demand a below-cost (or even negative) price. With credit cards, for example, networks often charge cardholders a lower fee than merchants because cardholders are more price sensitive. In fact, the network might well *lose* money on the cardholder side by offering rewards such as cash back, airline miles, or gift cards. The network can do this because increasing the number of cardholders increases the value of accepting the card to merchants and, thus, increases the number of merchants who accept it. Networks can then charge those merchants a fee for every transaction (typically a percentage of the purchase price). Striking the optimal balance of the prices charged on each side of the platform is essential for two-sided platforms to maximize the value of their services and to compete with their rivals.” (Internal citations to economic literature omitted. Emphasis in original.)

¹⁰³ Expert Report and Declaration of Lorin Hitt Ph.D., at Figure 24 and ¶ 237. (“Figure 24 shows the proportion of apps by app genre in the App Store that were free-to-download and did not have in-app purchases (and thus did not monetize at all through the App Store and paid no commissions). While most apps do not generate any revenue from transactions through the App Store, apps in different genres have different likelihoods to have monetized through the App Store. For example, only 3.5 percent of business apps are monetized through the App Store (in other words, almost all developers are earning money from their app by monetizing in other ways, or transacting with consumers in other places) while in contrast almost one-third of photo and video apps monetize directly through paid transactions in the App Store.”)

¹⁰⁴ Expert Report and Declaration of Lorin Hitt Ph.D., at ¶ 66. (“I find that 43.9 percent of proposed class developers had at least one app that only had free transactions.”)

¹⁰⁵ Expert Report and Declaration of Dr. Itamar Simonson, Ph.D., August 10, 2021, at ¶ 125.

Professor Simonson's survey results indicate that privacy and malware protection are seen by consumers as "must have" features of the Apple App Store, and these features were "most important in driving [survey respondent] choices to use the Apple App Store" over a hypothetical competing app store with lower average app prices.¹⁰⁶

108. Professor Elhauge asserts that iOS app stores in the but-for world would be differentiated.¹⁰⁷ However, he fails to take this differentiation into account in comparing what he should have analyzed as the two-sided prices of the App Store and purported comparable app transaction platforms. The value to consumers of providing free-app distribution and app review should be incorporated into the two-sided price. Professor Elhauge compares one-sided prices across transaction platforms in order to imply that Apple's commission rate represents an exercise of market power. This is improper because it fails to acknowledge the costs—such as those involved in providing free apps and app review services—that platforms incur to encourage participation in the other side of the platform.¹⁰⁸

VI.D.3. Professor Elhauge fails to analyze the competitive pressures on Apple in either the actual or the but-for world

109. Professor Elhauge assumes that in the but-for world the addition of iOS app distribution competition would cause Apple to significantly lower its App Store commission rates, and uniformly so, across all categories of app transactions.¹⁰⁹ This assumption is not supported by any analysis proffered by Professor Elhauge and is inconsistent with the empirical facts, as described below in section VII.
110. Professor Elhauge not only fails to support his assumption that commission rates would uniformly fall, but he also explicitly dismisses the differing competitive pressures on Apple's compensation terms in the but-for world that would arise from platforms for app transactions other than on iOS devices.¹¹⁰ The strength and diversity of these competitive pressures among different categories of app transactions are among the marketplace facts that render incorrect Professor Elhauge's assumptions. Yet, instead of properly evaluating these competitive pressures, he dismisses them. He seems to find

¹⁰⁶ Expert Report and Declaration of Dr. Itamar Simonson, Ph.D., August 10, 2021, at ¶¶ 55–62.

¹⁰⁷ See Elhauge Report, at ¶ 87. ("Although rival iOS app distributors would be *close* substitutes to the iOS App Store for developers, they would *not* be *perfect* substitutes. This is because the various iOS app distributors would still differ in ways that would cause developers to generally prefer certain iOS app distributors on average (vertical differentiation) and in ways that makes different developers' preferences vary (horizontal differentiation).") Emphasis in original.)

¹⁰⁸ See, e.g., Eric Emch and T. Scott Thompson, "Market Definition and Market Power in Payment Card Networks," *Review of Network Economics*, 5(1), March 2006, 45–60, at 48. ("Our focus here, for the purposes of analyzing market definition and market power in payment card networks, is not on interchange per se, but on the net price charged by the network to merchants and issuers. Since interchange fees are not retained, an independent network monopolist has no incentive to exercise market power through excessive interchange rates. Rather *the total price charged by the network and retained for itself is the proper focus of both the hypothetical monopolist test and any subsequent market power analysis.*") Emphasis added.)

¹⁰⁹ If Apple were to lower its commissions in the but-for world differentially for different categories of app transactions, that would indicate that competitive conditions differ among categories of app transactions, which would be inconsistent with Professor Elhauge's claim of a single relevant market for the reasons explained above.

¹¹⁰ Elhauge Report, at ¶ 124.

this necessary for his argument, because otherwise it would be unclear or even doubtful that the supposed additional competition in the but-for world would be significant, and uniformly so, relative to all the other extant sources of competition. Moreover, it would be correspondingly unclear or doubtful that the resulting compensation decisions of Apple would be significantly different or homogeneous as between the current and but-for worlds. In that case, what Professor Elhauge construes as the HMT would not yield the findings he claims for it, and what he claims is the HMT argument for his market definition would fail. There is much substantive information indicating significant substitutability for transactions on the App Store, as discussed in detail elsewhere and below. However, in terms of Professor Elhauge's arguments, his dismissal of that competition is thoroughly at odds with his presentation.

111. Not only does Professor Elhauge dismiss the competitive pressures on Apple's compensation terms in the but-for world that would arise from platforms for app transactions other than on iOS devices, but he also refuses to address these competitive pressures on Apple in the actual world. He does not address the question of how it is that he assumes Apple is maximizing its profits in the actual world with its App Store compensation model.¹¹¹ Of course, addressing that question would necessarily recognize the powerful forces that shape Apple's decisions, including competition from other platforms for digital app transactions and the network effects that have built the successful confluence of developers and consumers employing Apple's platform. Professor Elhauge's recognition of these facts would be head-on inconsistent with his dismissal of these competitive forces in his but-for world.
112. It is also important to recognize that the particular sources of competition to the App Store for digital app transactions are significantly different for different types of apps. (See section VII.) Accordingly, not only has Professor Elhauge ignored preemptorily the importance of these sources of competition in both the actual and the but-for worlds, but he has also lost sight of the need for different analyses of relevant markets for the transactions associated with different types of apps. There is no commonality across the purported class for the necessary analysis of relevant markets, even under the methodologies advocated by Professor Elhauge.

VII. Market Definition Is Not a Common Issue Because App Transaction Services Span Multiple Relevant Markets

VII.A. There is no singular app transaction market

113. Clustering or otherwise aggregating all app transaction services is inappropriate in this case because the competitive conditions in which app transactions take place vary among the apps being transacted. In particular, the set of transaction platforms to which an end-user and a developer can substitute to consummate a transaction for app X can be significantly different than the set of transaction platforms to which an end-user and a developer can substitute to consummate a transaction for a different app Y.
114. I illustrate this with two examples of types of app transactions where both consumers and developers face distinctly different substitution opportunities than for other types

¹¹¹ See Elhauge Report, at ¶ 108.

of app transactions: (a) game app transactions and (b) TV and video streaming app transactions (hereafter “video streaming app transactions”). A key differentiator for each of these two types of app transactions is the set of transactions platforms with which the App Store competes for the provision of these transactions. For both sets of app transactions, iOS-using consumers and app developers can and do choose to transact for the app on non-iOS transaction platforms. Moreover, both iOS-using consumers and app developers can substitute away from effectuating the transaction on the App Store to consummating the transaction on a non-iOS app transaction platform.

115. I refer to and rely on the discussion and analysis of the record evidence performed by Professor Hitt.

VII.A.1. Digital game transactions comprise a distinct relevant app transaction market

116. One such example of a distinct relevant market in which the App Store competes is the market for digital game transactions. Professor Hitt shows that there are many types of devices on which these games can be played and many digital game transaction platforms where game-playing consumers and game-creating developers can transact.
117. Professor Hitt presents several analyses that demonstrate that digital game transaction platforms provide services that are close substitutes—both for the same game as well as across games—whether one adopts the perspective of the game-playing consumer or that of the game-creating developer.
118. Professor Hitt documents that developers choose the devices for which to create their games and the digital game transaction platforms on which to offer their games to consumers. Game developers can and do write their games to be played on mobile devices, personal computers, and consoles. Developers can take advantage of cross-platform “game engines” to ease targeting a game to multiple devices.¹¹²
119. Game developers can and do choose to offer their games to consumers on any subset or all of numerous digital game transaction platforms, including those for mobile devices (e.g., the App Store, Google Play, the Samsung Galaxy Store, and the Amazon Appstore), for Windows and Mac personal computers (e.g., the Mac App Store, the Epic Games Store, Steam, and the Microsoft Store for PCs), and for consoles (e.g., the PlayStation Store, Nintendo eShop, and the Microsoft Store for Xbox).
120. For example, Professor Hitt analyzes data from App Annie that identifies the top games, by number of downloads and by app-store revenue, on the App Store and on Google Play as of December 31, 2019. Professor Hitt’s analysis finds that (a) 99.0% of the Top 100 grossing games on the App Store are also available on Google Play and (b) 100.0% of the Top 100 grossing games on Google Play are available on the App Store.

¹¹² Expert Declaration of Lorin Hitt, Ph.D., August 10, 2021, market-definition appendix (hereafter “Hitt market-definition appendix”), at ¶ 18 (“[D]evelopers are able to choose from a variety of game developer engines—such as Unity, Unreal Engine, CryEngine, GameMaker Studio, and more—that offer similar capabilities for distributing across platforms.”)

121.



122. Another example is provided by information from Roblox, a highly popular game that had 150 million Monthly Active Users (“MAUs”) in May 2020.¹¹⁵ Professor Hitt reported the distribution of Roblox MAUs across types of devices for the first nine months of 2020: Android (49.2%) had nearly half of MAUs, desktop (25.8%) had approximately one quarter, iOS had 21.9%, and Xbox had 3.0%.¹¹⁶
123. Professor Hitt presents analyses of data that show that many iOS-using game-playing consumers use, own, or can access multiple types of non-iOS devices for which developers have created games. For example, Professor Hitt cites to a survey of iPhone owners in July 2020 that found that 55 percent owned a Windows PC (i.e., desktop or laptop), 44 percent owned a Mac personal computer, 30 percent owned a gaming console, and 21 percent owned a non-iPad tablet.¹¹⁷ Professor Hitt also cited a survey performed by Professor Dominique Hanssens of users of the App Store. Professor Hanssens found that 81 percent of App Store users regularly used a non-iOS device (non-iOS smartphone; non-iOS tablet; laptop; desktop; gaming console; or gaming-specific handheld device). This result also showed that 71 percent regularly use a laptop, 48 percent regularly use a desktop, 41 percent regularly use a gaming console or handheld gaming device, 27 percent regularly use a non-iOS smartphone, and 23 percent regularly use a non-iOS tablet.¹¹⁸
124. The opportunity to play digital games on all these different platforms also goes along with the opportunity to effectuate transactions for the purchase of game apps and/or game in-app purchase transactions on all these different platforms.
125. Game developers have many options for monetizing their games. They can choose to have paid apps, free apps with in-app advertising, free-to-download apps with in-app purchases, and subscriptions.¹¹⁹
126. A game developer can offer purchases through the App Store, or outside their iOS app on another transaction platform or on their own website where the user can consume the purchased content within the iOS app.¹²⁰ This can be implemented through the use

¹¹³ Hitt market-definition appendix, at ¶ 8. (“Minecraft, one of the best-selling video games of all time, is available through many different transaction platforms including the App Store, Google Play, Microsoft Store, Amazon Appstore, Nintendo eShop, and PlayStation Store, as well as directly from Minecraft’s website.”)

¹¹⁴ Hitt market-definition appendix, Figure 3.

¹¹⁵ Hitt market-definition appendix, at ¶ 9.

¹¹⁶ Hitt market-definition appendix, Figure 4.

¹¹⁷ Hitt market-definition appendix, at ¶ 29.

¹¹⁸ Hitt market-definition appendix, at ¶ 30. See also *ibid.*, Figure 6.

¹¹⁹ Hitt market-definition appendix, ¶ 2.

¹²⁰ Hitt market-definition appendix, ¶ 21.

of common user account or “single sign-on” service. This also allows the user to switch playing to a different platform while retaining the user’s game progression (the state of the game) as well as the user’s inventory of purchased game assets.¹²¹ This capability is used by many game developers, such as Epic Games for Fortnite (in conjunction with the virtual currency V-bucks), Roblox (in conjunction with the virtual currency Robux), and King for Candy Crush Saga (in conjunction with the virtual currency “gold bars”).¹²²

127. Accordingly, transactions for purchasing a game and/or in-app content for a game on any other of the platforms on which the game is available are close substitutes for the corresponding transactions on the App Store. These alternative transactions are readily available to most users of the App Store, as shown by the consumer multihoming data above. These alternative transactions have the same functionality as their counterparts on the App Store. The alternative transactions are offered to consumers by the developers who evidently find that their own multihoming and openness to consumer multihoming are a strategy that is net profitable, no doubt fostered by their network effects.
128. All of these characteristics of the game app transactions implemented on the App Store that can also be implemented on alternative game transaction platforms imply that game app transactions constitute a distinct relevant market. The competing participants in this relevant market are the game transaction platforms that enable the closely substitutable transactions themselves. The relevant market of game app transactions is distinct because this set of market participants and their competitive interactions are significantly different than those that relate to other groups of apps.
129. Data are not generally available to implement a quantitative HMT of the digital game transaction market. Although data are also not available to track individual consumers’ substitution from one digital game transaction platform to another, Professor Hitt was able to utilize three analytic opportunities to assess whether iOS-using game-playing consumers did in fact substitute from transacting for digital games on the App Store to instead effectuating those transactions on a non-iOS digital game transaction platform. Each of these three analyses demonstrated such substitution.
130. First, Professor Hitt analyzed App Store data to detect when an iOS user downloaded an iOS “companion app” for a game console, which would likely be associated with that user newly acquiring, or newly intending to play games on, the associated console.¹²³ His analysis found that game spending on the App Store by the companion-app group grew more slowly following the download of the companion app compared to the growth in game spending on the App Store by a control group (i.e., that did not download such a companion app). The difference in growth rates (measured over the three-year period FY2017–FY2019) between the two groups is [REDACTED] percentage points.¹²⁴

¹²¹ Hitt market-definition appendix, ¶ 22.

¹²² Hitt market-definition appendix, ¶ 23.)

¹²³ Hitt market-definition appendix, ¶ 48.

¹²⁴ The average user spend growth rate over the three-year period for the control group was approximately [REDACTED]%; the rate for the companion-app group was approximately [REDACTED]%. There were [REDACTED] in the control group; there were [REDACTED] in the treatment group. Hitt market-definition appendix, § 1.9.1, ¶ 49 and Figure 11.

131. Professor Hitt interprets this slower growth in game spending on the App Store by the companion-app iOS users as likely reflecting these users diverting game expenditures that otherwise would have been transacted on the App Store to other digital game transaction platforms associated with the console game.¹²⁵
132. Second, Professor Hitt studied the launch of Fortnite on the Nintendo Switch device by Epic Games in June 2018. Professor Hitt analyzed Fortnite data produced by Epic that allowed him to track each Fortnite player's playing time and Fortnite expenditures—over time and by platform. Professor Hitt took advantage of the launch of Fortnite on the Nintendo Switch to assess whether this event affected the playing and spending patterns of iOS Fortnite players. He focused on iOS users that accessed Fortnite on both iOS and Nintendo Switch in June 2018. He found that in subsequent months, this group played Fortnite less on iOS relative to their baseline, and spent less on Fortnite on iOS relative to their baseline, than did a control group (that played Fortnite on iOS but not Nintendo Switch in June 2018).^{126,127} Professor Hitt interprets this analysis to indicate that iOS Fortnite users substituted their Fortnite transactions from the App Store to Nintendo eShop, i.e., to another digital game transaction platform.
133. Third, Professor Hitt again analyzed Fortnite data produced by Epic, this time investigating the effect of Fortnite's removal from the App Store in August 2020 (corresponding to Epic's "Hotfix"¹²⁸) on iOS users' Fortnite expenditures. If iOS users had been unable or unwilling to substitute their Fortnite play and transactions to other devices and digital game transaction platforms, Epic would have seen a sharp decline in the Fortnite expenditures of iOS players (compared to the alternative where Fortnite remained available on the App Store). Instead, Professor Hitt's analysis found that, from the pre-Hotfix point in time July 2020 to the month following the Hotfix, September 2020, Epic retained the vast majority (81.1%) of the revenue that Epic would have expected to receive from iOS Fortnite players on all non-Google platforms, if Fortnite

¹²⁵ Hitt market-definition appendix, at ¶ 49. ("The decline in relative spending for users who downloaded a companion app could reflect both shifting of transactions from the App Store to a competing platform for the same game the user would have purchased through the App Store or the user's choice to purchase an entirely different game. ")

¹²⁶ The control group has 13.2 million users who accessed Fortnite on iOS in June 2018 but did not access Fortnite on Nintendo Switch between June 2018 and March 2019. The treatment group had 457K members that accessed Fortnite on both iOS and Nintendo Switch in June 2018. For the difference between these two groups' behavior over time (measured in (a) time spent playing Fortnite on iOS and (b) Fortnite revenue on iOS), see Hitt market-definition appendix, Figures 12 and 13, respectively.

¹²⁷ Prior to the launch of Fortnite on Nintendo Switch, both groups had similar growth rates in playing time on iOS and Fortnite expenditures on iOS. (Hitt market-definition appendix, at ¶ 55.)

¹²⁸ Rebuttal Expert Report of Lorin Hitt, Ph.D., March 15, 2021, (*Epic v. Apple*), at ¶ 35. "On August 13, 2020, Epic implemented a 'Hotfix' update on its iOS Fortnite app that allowed customers to bypass Apple's in-app payment functionality and instead directly purchase V-bucks in the app from Epic. On the same day, Epic implemented a similar update on its Fortnite app for Android on Google Play, allowing customers to bypass Google Play's in-app payment functionality. Apple subsequently removed Fortnite from the App Store, preventing new consumers from downloading the app or existing users from downloading updates until Epic updates the app to bring it back into compliance with the App Store rules. However, iOS users who had already downloaded Fortnite remained able to play it."

had not been removed from the App Store, after accounting for general market and usage trends.^{129,130,131}

134. Professor Hitt interprets this result as indicating that iOS Fortnite users (both those that “single home” on iOS and those that “multihome” on iOS and other platforms) switched a significant part of their pre-Hotfix Fortnite spending to non-iOS and non-Google digital game transaction platforms.
135. These three analyses demonstrate iOS users’ and game developers’ substitution away from their digital game transactions on the App Store to competing digital game transaction platforms. This quantitative evidence confirms my conclusion articulated above that there is a distinct relevant market for game app transactions substantially beyond those implemented on iOS platforms.

VII.A.2. TV and video streaming app transactions comprise a distinct relevant app transaction market

136. A second example of a distinct relevant market in which the App Store competes is the market for TV and video streaming app transactions. Among iOS apps, these apps are a subset of the “Entertainment” genre. Professor Hitt does not attempt to identify all video streaming apps; to do so would require an app by app inquiry. Professor Hitt does identify the top 14 video streaming apps ranked by downloads and App Store revenue. The video-streaming apps Professor Hitt identifies for his analyses are Amazon Prime Video, Disney+, HBO Max, Hulu, Netflix, Paramount+, Peacock, Philo, Pluto TV, Roku, SHOWTIME, STARZ, Tubi, and YouTube TV. Professor Hitt documents that many of the firms providing these video-streaming apps recognize several of the others as competitors in public filings.¹³²
137. Professor Hitt presents industry facts, data, and analysis that demonstrate that video-streaming transaction platforms provide services that are close substitutes—whether one adopts the perspective of the consumer or that of the developer.
138. Professor Hitt documents that video-streaming app transactions are recognized as comprising a well-defined market by its participants and analysts.¹³³ He finds that the 14

¹²⁹ Hitt market-definition appendix §1.9.3 and Figure 14. See also Supplement to Rebuttal Expert Report of Lorin Hitt, Ph.D., March 17, 2021 (*Epic*), at Exhibit 6, Note 1: “The percent of pre-Hotfix revenue retained for all iOS users is calculated as the total iOS user revenue on all “platforms” in the specified month divided by the expected 2020 retention dollar amount on all “platforms” in that month, i.e. monthly revenue that would be expected from all iOS users in September – December, if Fortnite were not removed from the App Store in August 2020 after accounting for general market and usage trends. All ‘platforms’ excludes Google.”

¹³⁰ Professor Hitt found even larger fractions of retained revenue when the final month of the comparison window was extended to October (84.9%), to November (87.7%), and to December (86.2%). Supplement to Rebuttal Expert Report of Lorin Hitt, Ph.D., March 17, 2021, in *Epic v. Apple*, at § 2.1, at Exhibit 6.

¹³¹ For additional detail on Professor Hitt’s analysis, see Supplement to Rebuttal Expert Report of Lorin Hitt, Ph.D., March 17, 2021, in *Epic v. Apple*, at § 2.1.

¹³² See Hitt market-definition appendix, at Figure 16. This figure summarizes the extent to which the identified video-streaming apps acknowledge, in their 2020 Forms 10-K, others of the identified video-streaming apps as their competitors. For example, Hulu, Paramount+, Peacock, SHOWTIME, STARZ, and YouTube TV recognize as their competitors Amazon Prime, Disney+, HBO Max, Hulu, Netflix, and Paramount+.

¹³³ Hitt market-definition appendix at ¶ 69.

video-streaming apps he considers generated over \$1 billion through the App Store's U.S. storefront in calendar year 2020 from app downloads and in-app purchases.¹³⁴ Professor Hitt determined that these apps were associated with 84.3 million accounts, of which 15.5 million accounts spent money on these apps through the App Store's U.S. storefront in calendar year 2020.¹³⁵

139. Professor Hitt documents that there are multiple types of devices on which video-streaming developers can choose to make their apps available, and on which consumers can consume the provided video content. These devices include mobile devices (i.e., smartphones and tablets), personal computers, some game consoles, media players (such as the Roku), and Smart TVs. Developers can and do also offer their content—and consumers can view that content—directly on the web through a browser.
140. Professor Hitt shows that there is a multiplicity of transaction platforms on which video-streaming developers and consumers can meet to consummate transactions. Professor Hitt documents that all of the top video-streaming apps he considers are available on several alternative transaction platforms. In particular, all fourteen of the video-streaming apps he identifies are available on all of the following platforms: App Store, Google Play, Amazon Appstore, Smart TVs, Roku (device), and Fire TV, as well as available on websites.¹³⁶
141. Professor Hitt presents data showing that iOS users own multiple devices that can be used for viewing the content of video-streaming apps and transacting for these services. For example, Professor Hitt cites to a survey of iPhone owners in July 2020 that found that █ percent owned a Windows PC personal computer (i.e., desktop or laptop), █ percent owned a Mac personal computer, █ percent owned a Smart TV, █ percent owned a gaming console, and █ percent owned a non-iPad tablet.¹³⁷ As discussed above, Professor Hitt also cited survey data by Professor Hanssens showing that █ percent of App Store users regularly used a non-iOS device (non-iOS smartphone; non-iOS tablet; laptop; desktop; gaming console; or gaming-specific handheld device).
142. The opportunity to download video-streaming apps, and view their content, on these different platforms that are generally available to iOS consumers also goes along with the opportunity to effectuate transactions for subscriptions to, and any other purchases from, these video-streaming apps. Professor Hitt documents that video-streaming apps share a common business model, typically monetizing their service through subscription transactions across multiple platforms as well as through web browsers. Developers typically allow their subscribers to maintain a device-agnostic user account, and this facilitates subscribers' use of the service across devices, while choosing whatever platform to implement their subscription transactions.
143. Because most iOS users have access to non-iOS devices, they have the ready ability to implement video-streaming transactions through transaction platforms other than the App Store. Moreover, all iOS users can consummate video-streaming transactions on

¹³⁴ Hitt market-definition appendix at ¶ 69.

¹³⁵ Hitt market-definition appendix at ¶ 69.

¹³⁶ See Hitt market-definition appendix, Figure 17.

¹³⁷ Hitt market-definition appendix, § 1.6, citing Apple Market Research and Analysis, "iPhone Owner Study," October 2020, APL-EG_06596359 – 62 at APL-EG 06596361–2.

their iPhones but outside the App Store since all of the leading video-streaming app developers allow transactions on their websites, and all iOS devices allow access to a web browser. On iOS, these video-streaming apps are eligible for the “reader rule,” which allows the developer and consumer to transact outside of the App Store for content that the consumer can view within the iOS video-streaming app.¹³⁸ Thus, non-iOS transaction platforms and websites accessed through iOS devices or any other platform are substitutes for the App Store for video-streaming transactions. These transactions can and do take place on transaction platforms associated with the various non-iOS devices as well as the developers’ websites accessed in any fashion..

144. Accordingly, transactions for subscribing to, or otherwise purchasing content from, a video-streaming app on any other of the platforms or websites on which the app is available are close substitutes for the corresponding transactions on the App Store. These alternative transactions are readily available to users of the App Store, as shown by the consumer multihoming data above and the universal availability of a web browser to iOS users. These alternative transactions have the same functionality as their counterparts on the App Store. The alternative transactions are offered to consumers by the developers who evidently find that their own multihoming and openness to consumer multihoming are a strategy that is net profitable.
145. These characteristics of the video-streaming app transactions implemented on the App Store that can also be implemented on all the alternative video-streaming app transaction platforms imply that video-streaming app transactions constitute a relevant market. The competing participants in this relevant market are the video-streaming transaction platforms that enable the closely substitutable transactions themselves.
146. The relevant market of video-streaming app transactions is distinct because this set of market participants and their competitive interactions are significantly different from those that relate to other groups of apps. For example, the set of devices on which video-streaming app transactions can take place is not the same as the set of devices on which digital game transactions can take place, although there is overlap (mobile devices and some consoles). Some digital game transaction platforms do not offer video-streaming apps, e.g., the Epic Games Store and the Steam Store. Obversely, some devices and platforms for video-streaming app transactions (e.g., Smart TVs and media players, like a Roku) do not typically provide digital game transactions.¹³⁹ Video-streaming apps closely compete with each other, as do competing game developers, without any

¹³⁸ The Reader Rule “allow[s] a user to access previously purchased content or content subscriptions (specifically: magazines, newspapers, books, audio, music, and video)” on “Reader Apps” without having to make the digital good available for purchase through the App Store. (App Store Review Guidelines, at § 3.1.3(a)); Reader Apps are “apps where users exclusively purchase or subscribe to content outside the app, but enjoy access to that content inside the app on their Apple devices. Examples include books, music, and video apps. In these cases, developers receive all of the revenue they generate from bringing the customer to their app. Apple receives no commission from supporting, hosting, and distributing these apps.” (“Principles and Practices,” App Store, <<https://www.apple.com/uz/ios/app-store/principles-practices/>>, accessed on August 9, 2021.) Examples of reader apps include Kindle, Netflix, and Dropbox. This rule enables both the Netflix and the YouTube TV apps to not permit transactions through the App Store but rather require that consumers transact through another platform. Once the subscriber purchases through another mechanism (such as via a web browser), the consumer can view the video service on the iOS app.

¹³⁹ Hitt market-power appendix, ¶ 73.

evidence of correspondingly direct competition between the two genres of entertainment. Video-streaming apps exhibit a common subscription-oriented business model for their monetization, which stands in stark contrast to the approach by game app developers for whom the vast majority of paid game transactions are *non*-subscription in-app purchases.¹⁴⁰

147. Thus, the available evidence shows that video-streaming app transactions constitute a distinct relevant market. Data are not generally available to implement a quantitative HMT of the video-streaming app transactions market, and data are not generally available to track individual consumers' substitution from one video-streaming transaction platform to another. However, Professor Hitt was able to assess the substitution of iOS-using consumers to video-streaming transactions away from the App Store that resulted from a change in policy by Netflix. His analysis demonstrates significant substitution.
148. Prior to December 2018, Netflix belonged to Apple's Video Partner Program and permitted iOS users to subscribe to Netflix through the Netflix iOS app.¹⁴¹ In December 2018, Netflix decided to no longer allow any paid transactions through the App Store. iOS users that wanted to initiate a subscription to Netflix could not do so from within the Netflix iOS app; instead they would need to sign up for a Netflix subscription on another transaction platform or from Netflix's website—at which point they, and all legacy iOS subscribers, could view Netflix's content via the Netflix iOS app.
149. Professor Hitt analyzed App Store data and data reported by Netflix to assess what effect Netflix's policy change had on iOS consumers' new subscriptions to Netflix. If iOS consumers were unable or unwilling to substitute their video-streaming transactions away from iOS to other transaction platforms (or to video-streaming providers' websites), Netflix would have seen a sharp decrease in the rate of new subscriptions by iOS users. Professor Hitt's analysis, however, shows that this did not happen. His analysis indicated that Netflix's App Store revenue declined after the change.¹⁴² However, Professor Hitt's analysis showed that Netflix's reported number of paid memberships grew at an approximately steady pace both before and after Netflix stopped accepting new subscriptions through the App Store. Professor Hitt concluded that Netflix's policy change did not lead to a decrease in the number of initial downloads of the Netflix iOS app.
150. Professor Hitt's interpretation of his analysis is that, following the change in Netflix's policy, Netflix and iOS users both substituted video-streaming transactions that would have occurred on iOS onto non-iOS transaction platforms. The analysis is evidence that iOS users and video-streaming developers can substitute their video-streaming transactions away from the App Store to competing transaction platforms.

¹⁴⁰ Hitt *Epic* Rebuttal, ¶ 183, Exhibits 25 and 26. See also Hitt market-definition appendix, ¶ 79.

¹⁴¹ Juli Clover, "Netflix No Longer Offering In-App Subscription Options on iOS Devices," MacRumors, December 28, 2018, <<https://www.macrumors.com/2018/12/28/netflix-no-more-itunes-billing-options/>>, accessed on August 9, 2021.

¹⁴² Legacy iOS subscribers were still permitted to renew their subscriptions through the App Store. Thus, Netflix's App Store revenue did not decline to zero.

151. This quantitative evidence of substitution confirms my conclusion articulated above that there is a distinct relevant market for video-streaming app transactions, and that the relevant transactions extend far beyond the confines of iOS.

VII.B. Market definition is not a common issue because class members differ according to the relevant app transaction markets in which they purchase or sell

152. Plaintiffs' experts completely fail to distinguish these different groups of app transactions by ignoring the different competitive conditions they face. Moreover, because there are multiple relevant app transaction markets, (a) the relevant market(s) in which any given consumer participated would be different than the relevant market(s) in which some other consumers participated¹⁴³ and (b) the relevant market(s) in which any given developer participated would be different than the relevant market(s) in which some other developers participated.¹⁴⁴ Thus, antitrust issues that depend on market definition are not common to all class members.

VIII. Plaintiffs' Experts' Market Power Opinions Are Unreliable

VIII.A. Assessing market power

153. A firm has significant market power if it is able to profitably raise price substantially above (or depress quality below) what it would be in a competitive market for a sustained period of time. As I explained in section IV, determining whether a firm has significant market power is a critical threshold step in any inquiry about whether the challenged business practices of that firm are anticompetitive.
154. Evidence of significant market power can be provided via an evaluation of market structure (i.e., market concentration, the number of market participants, and their dynamics) and market outcomes (i.e., quantity, quality, price, and their causal factors). However, such analyses need to be carried out and interpreted with care.
155. Evaluating market structure is an indirect way to assess market power. This evidence may be consistent with a conclusion about market power, but can be particularly misleading if markets are not defined properly. Moreover, while unconcentrated markets with many small players are commonly considered to be competitive, the reverse fails to hold. Concentrated markets do not necessarily indicate a lack of competition and the

¹⁴³ Some consumers purchased games while other consumers purchased no games. See Expert Report and Declaration of Lorin Hitt Ph.D., Figure 18, showing that 72.3 percent have purchased games, and 27.3 percent purchased no games.

¹⁴⁴ See Expert Report and Declaration of Lorin Hitt Ph.D., Figure 28 and ¶ 242. ("Figure 28 shows the proportion of developers that offer apps in a particular genre that *only* offer apps in that genre. For example, out of the 21,102 developers in the proposed class that made transactions for a game app on the App Store in the class period, 46 percent offered *only* game apps. Moreover, 12 percent of developers that offered more than one app through the App Store offered *only* game apps. Developers of apps in other app genres, such as health and fitness, magazines and newspapers, stickers, and sports, are similarly concentrated in individual app genres and do not develop apps for other genres.")

existence of market power. Establishing market concentration is merely a first step in assessing market power.

156. Evaluating market outcomes such as price-cost margins, for example, may be a more direct way of evaluating market power, but such analysis must proceed with appropriate caution. For one, products are typically differentiated, and consumers care about both quality and price. Thus, focusing only on nominal price, rather than quality-adjusted price can lead to misleading conclusions. Moreover, as explained below, high margins may reflect the presence of large fixed costs or substantial investment risks, or risky competitive entrepreneurship that turned out well, and not market power.
157. Furthermore, market outcomes are interrelated, so price, quality, and quantity must be evaluated in tandem. For instance, price increases that are associated with increases in quality and quantity may likely be the result of procompetitive behavior, rather than an exercise of market power. Price increases are more likely to be associated with anticompetitive behavior if they are associated with declines in quality and/or quantity.
158. Finally, when assessing market power, it is important to recognize that the delineation of a relevant market can leave out substitutes that fall outside of the bounds of the defined market, but nonetheless provide competitive constraints on participants within the relevant market. Such competitive constraints would include both: (a) products that are less interchangeable for most consumers in the relevant market, but still could serve as substitutes for some consumers when faced with changes in price or quality; and (b) market entry from either new competitors or incumbent firms that would respond competitively to changes in price or quality by a firm attempting to exercise market power.

VIII.B. Plaintiffs' experts' improperly-defined relevant markets corrupt their market power opinions

159. To reliably analyze allegations of monopolization, questions of market power must be asked with respect to properly defined relevant markets. Although a finding that a firm has market power in some relevant market does not by itself imply that any business practice of the firm is anticompetitive, a finding that the firm does not have significant market power in the relevant market is sufficient to warrant a conclusion that the challenged practices are not anticompetitive.
160. Plaintiffs' experts have failed to reliably address issues of market power because they have relied on only improperly defined relevant markets.
161. For example, it is plain that any view of market position or market power in a relevant market is closely related to the appeal of the products to the actual and potential customers, the comparison between that appeal and the appeal of alternatives available to the customers, and thus the range and variety of the alternative substitutes in the relevant market. As detailed above, as well as in the Hitt report, the digital transactions related to different categories of apps have distinctly different sets of alternatives and rivals to those transactions implemented in the App Store. Accordingly, any assertions about Apple's market power over digital app transactions cannot be reliable or

demonstrated to be valid without analyses that deal with the different relevant markets in which such transactions can occur. The Plaintiffs' experts have not done so at all.

162. This failure by Plaintiffs' experts cannot be rectified by appeal to arguments about Apple's profitability generally or in any other narrower accounting categories. Professor Schmalensee's report discusses the implications of the two-sided nature of the transaction platform for the assessment of market power,¹⁴⁵ so I will just make a few observations:
163. Dynamic industries, such as Apple's, are characterized by repeated, large, sunk investments and high ongoing fixed costs.¹⁴⁶ Prices at or close to marginal cost are not "competitive prices" because the margins they generate are too small to cover the fixed costs or pay a return on the sunk investments.¹⁴⁷
164. Even persistently high profits are consistent with competitive markets that perform well for consumer welfare and social welfare; thus, high profits do not imply a firm has antitrust market power. Firms may earn economic profits for many reasons, for example because they are more efficient, more innovative, or more entrepreneurial than their competitors. They may have taken on large risks, or may have accumulated valuable intangible assets or intellectual property that allows their products to enjoy enhanced demand. High accounting profits may in fact reflect normal returns on the value of such intangible assets.^{148,149}
165. Accounting measures of the App Store's profitability also do not establish the existence of antitrust market power because of the difficulty of separating out the costs and profits of the App Store with the costs and profits arising from iPhone and iOS development generally. As explained in Mr. Malackowski's report, Plaintiffs' experts' profitability analyses are flawed because they "rely on economically arbitrary methods to allocate

¹⁴⁵ Expert Declaration of Richard Schmalensee, Ph.D., August 10, 2021, at § VII.

¹⁴⁶ See, e.g., Expert Declaration of James E. Malackowski, August 10, 2021, at ¶¶ 118–125.

¹⁴⁷ See, e.g., (a) William J. Baumol and Daniel G. Swanson, "The New Economy and Ubiquitous Competitive Price Discrimination: Identifying Defensible Criteria of Market Power," *Antitrust Law Journal*, 70(3), 2003, 661–685, at 661 ("The industries that are the hallmark of the 'new economy' are characterized by ... sunk outlays that are large and must be incurred over and over again, but the marginal cost—the cost of serving an additional customer—is virtually negligible. As economists are well aware, this is only a special case of a more general circumstance, the case of scale economies, where the prices of a firm's products, if set equal to the corresponding marginal costs, will condemn the enterprise to losses.") and (b) David S. Evans and A. Jorge Padilla, "Excessive Prices: Using Economics to Define Administrable Legal Rules," *Journal of Competition Law and Economics*, 1(1), 2005, 97–122 (hereafter "Evans and Padilla (2005)"), at footnote 23 ("Consider an industry where production involves significant fixed costs. In that case the equilibrium prices of the goods and services that are commercialized in that industry cannot equal their marginal costs of production; at those prices, firms could not recover their fixed costs and sooner or later would exit the market. Instead, the equilibrium prices will be above the marginal costs of production so as to cover the fixed costs of production.").

¹⁴⁸ See, e.g., Franklin M. Fisher and John J. McGowan, "On the Misuse of Accounting Rates of Return to Infer Monopoly Profits," *American Economic Review*, 73(1), March 1983, 82–97.

¹⁴⁹ See, e.g., Evans and Padilla (2005), at page 102 ("These problems [of using accounting data] become particularly severe in industries where firms invest and innovate regularly. In those industries, a few companies succeed but the winners typically obtain enormous profits. Those profits would appear excessive *ex post*, when the innovations are commercialized. However, from an *ex-ante* perspective and once the cost of capital is adequately adjusted for risk, competitors may earn normal profits; the huge profits earned by the winner(s) may just compensate for the huge losses made by all those who fail.")

inseparable joint costs.”¹⁵⁰ This conclusion is not surprising in light of the academic literature and the testimony of Apple executives.^{151,152}

166. Inasmuch as Plaintiffs link their claims of Apple market power to their claims that Apple’s App Store practices are anticompetitive, it is important to test that linkage against the surrounding history. When Apple first launched iOS-based devices and the App Store, back in 2007 and 2008, there could be no allegations of market power based on marketplace success that had yet to occur. Apple adopted many of the App Store policies that Plaintiffs challenged at the start (and they have only evolved in a manner more favorable to developers) deliberately to foster the appeal of the entire iOS platform for consumers and thus to developers, by assuring the security and reliability of the protected system.¹⁵³ Now that the iOS platform with its App Store practices has proven to be a dramatic success, Plaintiffs try to turn that success into proof of market power linked to the asserted anticompetitive interpretation of the App Store practices.

IX. Plaintiffs’ Experts’ Single-Brand Relevant Market Based on an Aftermarket Paradigm Is Inappropriate

IX.A. The foremarket/aftermarket approach is fundamentally inapplicable in this case

167. Single brands generally are not considered to constitute their own antitrust markets. This is because most markets involve differentiated products that are substitutable for one another. Confining a relevant market to a single brand requires more than simply pointing out that the App Store and iOS devices are differentiated from the Google Play Store and Android devices.
168. Professor McFadden, however, does just this, claiming the “relevant iOS apps and in-app content market” is an aftermarket, where, in the foremarket, consumers choose “OS installed mobile devices such as iOS mobile devices or Android mobile devices,” and in the aftermarket consumers download and install apps specific to the OS on their mobile

¹⁵⁰ Expert Declaration of James E. Malackowski, August 10, 2021, at ¶ 226.

¹⁵¹ See, e.g., (a) William J. Baumol, “Predation and the Logic of the Average Variable Cost Test,” *Journal of Law and Economics*, 39(1), April 1996, 49–72, at 59 (“[A]ll multiproduct firms have fixed costs incurred in common on behalf of two or more of their products. There is, however, no economically defensible way of dividing such costs up among the firm’s various products. As is well known, all methods for the allocation of common fixed costs are arbitrary.”); and (b) Franklin M. Fisher and John J. McGowan, “On the Misuse of Accounting Rates of Return to Infer Monopoly Profits,” *American Economic Review*, 73(1), March 1983, 82–97, at 82 (“[A]ccounting rates of return... provide almost no information about economic rates of return. ... [T]he economic rate of return is the only correct measure of the profit rate for purposes of economic analysis.”).

¹⁵² Neither Apple nor Epic allocate development costs. See Transcript of Proceedings, Volume 11, May 17, 2021, Epic Games, Inc. vs. Apple, Inc., No. C-20-5640 YGR, Testimony of Philip Schiller, at 2731–2372 (“Q. And was the cost of that development work allocated to the App Store in any way? A. No. Q. Has it—has the cost of developing APIs ever been allocated to the App Store specifically? A. No.”); and Transcript of Proceedings, Volume 2, May 4, 2021, Epic Games, Inc. vs. Apple, Inc., No. C-20-5640 YGR, Testimony of Tim Sweeney, at 228 (“Q. I would like to talk for just a moment about how Epic accounts for its development expenses. And isn’t it correct that Epic has no—makes no systematic effort to allocate its development costs among different projects? A. Yes.”)

¹⁵³ See section III.A.

device.¹⁵⁴ In this context, an “aftermarket product” is one (a) used together with a “primary product,” which is sold in a “primary market” or “foremarket,” and (b) purchased after the primary product is purchased.¹⁵⁵ Professor McFadden identifies the primary market as one for “iOS-installed devices.”¹⁵⁶ Professor Elhauge appears to adopt a “market for mobile devices like smartphones and tablets” as the primary market.¹⁵⁷

169. Professor McFadden claims this aftermarket framework in iOS apps is applicable just because “Apple does not permit other app stores to be available for iOS device consumers” and because “apps compatible with non-iOS devices do not function properly (or at all) on iOS devices.”¹⁵⁸ Professor McFadden states that these restrictions “make the iOS aftermarket a proprietary aftermarket.”¹⁵⁹ Professor Elhauge similarly states that he “analyze[s] iOS app and digital [in-app purchase] distribution services as an aftermarket to the smartphone and tablet markets...”¹⁶⁰
170. Both Professor McFadden’s and Professor Elhauge’s aftermarket arguments are premised on their untested “proprietary aftermarket” assumption that an iOS user that wants to use a particular app has no choice but to transact for that app on the App Store. However, as I discussed in section VII.A, many iOS users multihome on other devices on which they can transact for apps and in-app content that they want to enjoy. For many apps, and their associated in-app content, consumers can transact for those apps and in-app content on any of multiple types of non-iOS devices to which they have access. Similarly, developers can and do make their apps available on multiple platforms. That consumers and developers both can and do multihome creates opportunities for substitution across transaction platforms, by participants on both sides of the platform, without requiring substitution in devices, i.e., in the purported foremarket.
171. Professor McFadden asserts that “*common economic evidence* supports the conclusion that iOS-installed devices belong to the primary market, and the sales of iOS apps and in-app content constitute an aftermarket for the purpose of the market definition

¹⁵⁴ McFadden Report, (a) at ¶ 43 (“The relevant iOS apps and in-app content market is commonly referred to as an ‘aftermarket.’”) and (b) at ¶ 44 (“In the primary market, consumers choose OS installed mobile devices such as iOS mobile devices or Android mobile devices.”).

¹⁵⁵ See, e.g., Carl Shapiro and David J. Teece, “Systems competition and aftermarkets: an economic analysis of Kodak,” *The Antitrust Bulletin*, 39(1), Spring 1994, 135–162, at page 139 (“We define an ‘aftermarket transaction’ to be any transaction with two characteristics: (1) the aftermarket product or service is *used together with a primary product*, and (2) the aftermarket product or service is *purchased after the primary product*.” Emphasis in original.)

¹⁵⁶ McFadden Report, at ¶ 23. (“[C]ommon economic evidence supports the conclusion that iOS-installed devices belong to the primary market.”)

¹⁵⁷ See Elhauge Report, at ¶ 216. (“Apple’s experts have argued that its market power in the secondary iOS app distribution market is constrained by competition in the primary market for mobile devices like smartphones and tablets. ... [E]vidence common to the class indicates that competition in the primary mobile device market does not significantly constrain Apple’s market power in the secondary iOS app distribution market.”)

¹⁵⁸ McFadden Report, at ¶ 45. (“Apple does not permit other app stores to be available for iOS device consumers to use to download and install iOS apps and pay for in-app purchases. Also, apps compatible with non- iOS devices do not function properly (or at all) on iOS devices.”)

¹⁵⁹ McFadden Report, at ¶ 45. (“These restrictions make the iOS aftermarket a proprietary aftermarket in which only iOS device consumers can participate.”)

¹⁶⁰ Elhauge Report, at ¶ 180.

analysis.”¹⁶¹ Similarly, Professor Elhauge asserts that “[h]owever one resolves these market definition issues”¹⁶² or “issues on market share and market power, they are all *common to the class*”¹⁶³ because “the methodology, evidence, and analysis used ... would be the same even if every class member brought a separate antitrust suit.”¹⁶⁴ In particular, Professor Elhauge asserts that “the methodology, evidence, and analysis used to define the relevant market would be the same even if every class member brought a separate antitrust suit.”¹⁶⁵

172. Because consumers can multihome for the purpose of app transactions, and the ability to do so varies over both consumers and apps, and therefore over developers, the examination of market power is not a common question within either purported class.
173. Thus, because consumers and developers can substitute across transaction platforms without requiring substitution in the foremarket, the aftermarket framework does not apply. And any valid debate over this empirical conclusion is not remotely common across either putative class because the specific substitution opportunities for individual consumers and individual developers are markedly different.

IX.B. The economic relationship between sales of iOS devices and conduct toward the App Store is another reason why there is no relevant aftermarket

174. The economic relationship between sales of iOS devices and conduct toward the App Store is another reason why there is no valid relevant aftermarket applicable in this case. As explained in this section, inasmuch as Apple’s incentives with regard to its conduct towards the App Store are significantly intertwined with the impacts on its sales of iOS devices, it follows that there is no validity to the claim of a separate relevant market confined to the iOS App Store.
175. Apple’s incentives towards the App Store are tightly related to their anticipated impacts on sales of iPhones. This is the case because (a) consumers would soon learn of any diminution in the value of the iOS app ecosystem and (b) consumers have non-iOS device choices to which they could turn, whether for a first purchase of a smartphone or for a replacement or upgrade. These incentives are additive to those arising from the ability of developers and consumers to substitute away from the App Store for their app transactions, as discussed above.

¹⁶¹ McFadden Report, at ¶ 23. (Emphasis added.)

¹⁶² Elhauge Report, at ¶ 6. (“However one resolves these market definition issues, they are all common to the class because the correct definition of the relevant market is the same for all class members. Further, the methodology, evidence, and analysis used to define the relevant market would be the same even if every class member brought a separate antitrust suit.”)

¹⁶³ Elhauge Report, at ¶ 8. (Emphasis added. “However one resolves these issues on market share and market power, they are all common to the class because the correct calculation of each market share, as well as the correct conclusion on the existence of market power in each market, would be the same for all class members. Further, the methodology, evidence, and analysis used to calculate market shares and assess market power would be the same even if every class member brought a separate antitrust suit.”)

¹⁶⁴ Elhauge Report, at ¶¶ 6, 8.

¹⁶⁵ Elhauge Report, at ¶ 31.

176. Although Apple does not set the prices of apps and in-app content, its innovations, investments, and policies have a significant impact on the value of the iOS app ecosystem to iPhone users. (The quality and value of the iOS app ecosystem to consumers corresponds to the role that prices of later-purchased products and services play in traditional aftermarket analyses.) The economic evidence shows that consumers have access to sufficient relevant information to be well able to judge the value to them of the iOS app ecosystem before they purchase an iOS device, and to compare that with the value of the app ecosystem available on competing devices. Smartphones are a very popular product category.¹⁶⁶ As ownership of smartphones approaches ubiquity, consumers making decisions about what smartphone to purchase are likely to have no shortage of friends or family from whom they can get firsthand information about the many choices available to them. There is a torrent of journalistic and other content in the form of blogs, podcasts, YouTube videos, social media, and product reviews that cover the smartphone space.¹⁶⁷ If Apple did anything—whether by disadvantaging developers or in any other way—that had the effect of reducing the number, variety, quality, security, usability, or affordability of apps and in-app content, such news would likely get out fast to Apple’s existing and potential customers.
177. Moreover, Apple’s existing and potential customers have many non-Apple choices from which to pick a smartphone, including numerous models from manufacturers such as Samsung, LG, Motorola, and Google.¹⁶⁸ There is intense rivalry among smartphone manufacturers that takes the form of price competition, as well as rapid innovation and improvement in smartphone capabilities and features in many dimensions, such as cameras (both forward-facing and rear-facing, including resolution, number and focal length of lenses, lowlight performance, and onboard signal processing), display type and quality (including resolution, refresh rate, and dynamic range), battery life, selection of form factors, authentication mechanism (e.g., fingerprint or facial recognition), processor and GPU speeds (including frames per seconds for gaming), storage, and others.
178. Given the above landscape, Plaintiffs’ experts have failed to demonstrate how Apple could have an incentive to treat the purported aftermarket as a separate relevant market for independent profit maximization, rather than respecting the linkage of the vitality of the iOS app ecosystem as a crucial driver of its overall iPhone business.
179. In theory, adverse changes to conduct over later-purchased products or services that exploits an installed base of consumers typically would make sense only when the manufacturer has essentially given up on its reputation and its primary-market product because the product is at a technological dead end or the demand for its capabilities is sufficiently declining. In such a case, there are little or no future sales of the primary-

¹⁶⁶ As of February 2021, approximately 85 percent of US adults owned a smartphone. (“Mobile Fact Sheet,” Pew Research Center, <<https://www.pewresearch.org/internet/fact-sheet/mobile/>>, at chart “Mobile phone ownership over time,” accessed on August 4, 2021.

¹⁶⁷ See, e.g., (a) “Top 60 Essential Smartphone Blogs,” Wilson Signal Booster, 2021, <<https://www.wilsonsignalbooster.com/blog/top-60-essential-smartphone-blogs/>>, accessed on August 7, 2021, and (b) “Top 45 Smartphone Blogs and Websites to Follow in 2021,” Feedspot, August 6, 2021, <https://blog.feedspot.com/smartphone_blogs/>, accessed on August 7, 2021.

¹⁶⁸ See, e.g., Mark Spoonauer, “Best phones in 2021: The top smartphones rated,” Tom’s Guide, August 2, 2021, <<https://www.tomsguide.com/best-picks/best-phones>>, accessed on August 4, 2021.

market product at risk. Then it can be profitable for the manufacturer to “harvest the installed base” by treating the aftermarket as a separate market with no significant linkages to the primary-market product.

180. Such an end-of-life scenario is the opposite of the iPhone circumstances. For example, in 2019, Apple’s annual unit sales in the United States of iPhones and iPads combined was near an all-time high,¹⁶⁹ comprised of 68.3 million iPhones and 17.3 million iPads.¹⁷⁰ From 2012 through 2018 (the last year for which I have data), the number of iPhone users in the United States had grown each year, reaching 101.9 million in 2018.¹⁷¹
181. Plaintiffs’ experts assert that there are substantial switching costs that lock iPhone users into the iOS platform. Professor Elhauge states that “[c]onsumers are locked into the foremarket by high switching costs.”¹⁷² Professor McFadden states that “[c]ommon evidence supports the conclusion that mobile device users, and particularly iOS device consumers, have high costs of switching to a device with a different OS installed.”¹⁷³
182. If Plaintiffs’ experts were correct and their purported aftermarket were indeed a properly defined relevant market, their switching-cost claims would imply that Apple has had, for some long period of time, the incentive to take steps to greatly increase the cost of apps to iPhone users, because those users are—according to Plaintiffs’ experts—so locked in they would have no choice but to acquiesce to app-price increases.¹⁷⁴ However, the fact that Apple has *not* hugely increased its commission rate—in fact, has not increased its commission rate at all at any point since the App Store opened and in some contexts decreased it—is plain evidence that Plaintiffs’ experts have not properly modeled Apple’s incentives. In addition, I will point out just a few specific failings in that analysis.
183. First, Professor Elhauge’s calculation ignores the effect that harming the iOS app ecosystem would have on acquiring *new* iPhone customers, who by definition are not “locked in” to iOS and thus would be fully sensitive to changes in the iPhone value proposition. In the one-year period from 2017 to 2018 (the most-recent year for which I have data), the number of iPhone users in the United States increased by 5 million.¹⁷⁵ By ignoring these new iPhone users, Professor Elhauge in effect is incorrectly assuming that the iPhone is properly modeled by the end-of-life, “harvest the installed base”

¹⁶⁹ APL_APPSTORE_08822222.xlsx. According to APL_APPSTORE_08822222.xlsx, 2019’s total units sold for iPhone and iPad is 96.9% of the highest year’s units sold.

¹⁷⁰ Expert Declaration of Lorin Hitt, Ph.D., August 10, 2021, market-power appendix (hereafter “Hitt market-power appendix”), at ¶ 17. See also Rebuttal Expert Report of Lorin Hitt, Ph.D., March 15, 2021 (hereafter “Hitt Rebuttal Report (*Epi*)”), at ¶ 367 and Exhibit 59; APL_APPSTORE_08822222.xlsx.

¹⁷¹ Hitt market-power appendix, at ¶ 18 and Exhibit 10; see also Hitt Rebuttal Report (*Epi*), at ¶ 368 and Exhibit 60.

¹⁷² Elhauge Report, at ¶ 7.E.c.

¹⁷³ McFadden Report, at ¶ 67.

¹⁷⁴ For example, Professor Elhauge calculates that Apple could increase its commission rate by 5 percent (not 5 percentage points) and increase costs to each of a supermajority of iPhone users by only 26¢ over the lifespan of her device, assuming the commission-rate increase was fully passed on to consumers. Professor Elhauge observes that 26¢ is much less than his estimated cost of switching from iPhone to Android of \$138–\$155. (Elhauge Report, at ¶ 7.E.c. See also *id.*, at ¶ 231.)

¹⁷⁵ See Hitt Rebuttal Report (*Epi*), at ¶ 368 and Exhibit 60.

scenario I described above, rather than the empirically factual scenario that the iPhone is very popular and has a growing base of users.

184. Second, the significance to Apple of new iPhone users is *greater* when switching costs are greater, because the larger the switching costs the more valuable is every additional new customer. Professor Elhauge ignores the economic literature on switching costs which teaches that, when switching costs are significant, the incentive for a firm to improve its appeal in order to invest in customer acquisition can outweigh the incentive of the firm to harvest its installed base.^{176,177}
185. Third, Professor Elhauge asserts that “[c]onsumers hold smartphones on average for 2.6 years and thus cannot in the interim switch devices in response to variations in app distribution competition without incurring the cost of unnecessarily buying a new smartphone.”¹⁷⁸ However, Professor Elhauge’s cited smartphone-churn rate means that at any time there will be many consumers who would be ripe for switching to Android devices if Apple did anything to disadvantage the iPhone ecosystem in the interim. This would be a significant deterrent for Apple to do anything to reduce the value proposition of the iPhone.

IX.C. In fact, Apple has not exercised any market power in its conduct towards the App Store.

186. The restrictions on the distribution of iOS apps about which Plaintiffs complain have been in place since the App Store was first announced and before a single third-party iOS app had been distributed. To the extent Apple’s terms have changed, they have become more favorable to developers.
187. Thus, there has been no adverse surprise to developers and, therefore, no indirect adverse surprise to consumers therefrom. Similarly, the restriction on iPhone users that they cannot obtain native iOS apps from either third-party app stores or via sideloading—i.e., they may purchase only from the App Store—is as old as the iPhone itself; thus there has been no direct adverse surprise to consumers either.

¹⁷⁶ For a survey of the literature on switching costs, see Joseph Farrell and Paul Klemperer, “Coordination and Lock-in: Competition with Switching Costs and Network Effects,” in *Handbook of Industrial Organization*, Volume 3, eds. Mark Armstrong and Robert H. Porter, 2007, 1967–2072 (hereafter “Farrell and Klemperer”).

¹⁷⁷ See, e.g., Jean-Pierre Dubé, Günter J. Hitsch, and Peter E. Rossi, “Do Switching Costs Make Markets Less Competitive?,” *Journal of Marketing Research*, 46(4), 2009, 435–445, at 444. (“[E]quilibrium prices fall as switching costs increase for a realistic model. In some cases, prices fall by more than 15% and profits by more than 10%. This finding holds for a wide range of switching costs centered on those obtained from consumer panel data. High levels of switching costs must prevail to obtain results ... that switching costs make markets less competitive and provide additional profits.... [O]ur basic result applies to situations in which switching costs are more than double the purchase price.”)

¹⁷⁸ Elhauge Report, at ¶ 7.E.c. Similarly, see also McFadden Report, at ¶ 67. (“[T]he costs of hardware devices are significant, and as a result, device purchases are infrequent. An internal Apple market research presentation presents survey data showing that on average, consumers wait just under two years on average to replace their smartphone. ... In a 2019 letter to investors, Apple CEO Tim Cook attributed lower-than-expected iPhone revenues in part to increasing times between upgrades.”)

188. Therefore, as a matter of fact, there has not been an exploitation by Apple of its installed base.

X. Plaintiffs' Experts' Conclusions that Impact and Damages Can Be Determined on a Classwide Basis Are Fatally Flawed Because They Ignore that in the But-For World Apple Would Have the Incentive to Monetize its IP in Alternative Ways

X.A. All developers must license Apple's intellectual property, including in Plaintiffs' but-for world

189. Intellectual property “bestows on the owners of intellectual property certain rights to exclude others. These rights help the owners to profit from their use of the property.”¹⁷⁹ Although Apple could have chosen to be the exclusive developer of iOS native apps, it decided instead to offer a license to third-party developers to enable the procompetitive benefits from combining complementary factors of production.
190. Apple currently requires all developers to license its intellectual property through the Developer Program License Agreement (“DPLA”) before they may distribute an app through the App Store.¹⁸⁰ In exchange for this license, developers pay Apple both a fixed \$99 annual fee as well as the commission rates that Plaintiffs challenge in this matter.¹⁸¹
191. In the but-for world, developers selling through the App Store would continue to require a license to Apple's intellectual property.¹⁸² In addition, to the extent that the but-for world contemplates app distribution through alternative channels, such apps would also still require Apple IP and a new licensing arrangement.¹⁸³ All developers in the proposed Developer class have agreed to the DPLA and would be required to license Apple's IP in the but-for world.
192. Plaintiffs' experts, however, essentially ignore Apple's IP rights. Professor McFadden acknowledges that Apple charges developers a fee for its Apple Developer Program and its Apple Developer Enterprise Program, but he does not acknowledge that Apple has intellectual property that is accessed by developers through these programs.¹⁸⁴ Professor Elhauge mentions intellectual property only as a “significant barrier[] to entry and

¹⁷⁹ “Antitrust Guidelines for the Licensing of Intellectual Property,” U.S. Department of Justice and the Federal Trade Commission, January 12, 2017 (hereafter “IP Guidelines”), at § 2.1, citing to *Trinko*. (Emphasis added.)

¹⁸⁰ See section III.A.

¹⁸¹ Developers' Complaint, at ¶¶ 3–4.

¹⁸² I.e., the need for the license is not limited to distributing iOS apps on the App Store. The license is required for developing and distributing an iOS app generally (e.g., by using Xcode) and many apps are highly reliant on advanced APIs that Apple has incorporated into iOS (e.g., Metal).

¹⁸³ See, e.g., Expert Declaration of James E. Malackowski, August 10, 2021, at ¶¶ 188–201.

¹⁸⁴ McFadden Report, at ¶ 35. (“Apple collects a relatively small amount of revenue from a fixed \$99 annual fee charged to developers for its Apple Developer Program. Apple charges organizations seeking to deploy internal-use apps \$299 per year for its Apple Developer Enterprise Program.”) See also *id.*, at ¶ 36, where Professor McFadden estimates that the Developer Program \$99-fee revenues are about █% of the App Store commissions.

expansion in the U.S. smartphone and tablet market”¹⁸⁵ and, pointing to Apple’s IP specifically, as an obstacle developers need to invent around.¹⁸⁶ Professor Economides does not acknowledge Apple’s IP explicitly, while acknowledging that Apple charges developers a fee for the Apple Developer Program.¹⁸⁷

X.B. In the but-for world, Apple would have a strong economic incentive to choose to monetize its IP in ways that do not rely on iOS app transactions occurring on the App Store

193. Implicit within Plaintiffs’ experts’ reports (and explicitly stated in Economides expert report) is the assumption that, in the but-for world, developers would continue to have access to the same Apple IP they currently do today under the DPLA for the current \$99 annual fee.^{188,189}
194. As explained in Mr. Malackowski’s report, as an IP owner, Apple can monetize its IP in any of multiple different ways, as do many other IP owners.¹⁹⁰ At least until the present, one way that Apple has monetized its IP is through the commission it charges developers on certain classes of App Store transactions.¹⁹¹

¹⁸⁵ Elhauge Report, at ¶ 220.

¹⁸⁶ Elhauge Report, at ¶ 220. (“One of Apple’s experts in the related *Epic v. Apple* litigation acknowledged that Apple uses ‘its IP as a tool to prevent competitors from either copying existing technologies or bringing Apple’s “original” ideas to fruition first.’ Potential rivals must invent around this intellectual property, and researching and developing new technology in this industry is incredibly expensive; as evinced by Apple spending over \$18 billion in R&D in just the last fiscal year.”)

¹⁸⁷ See Economides Report, at (a) ¶ 69 (“Just like these other OS owners, Apple also offers resources for potential developers, in order to get more developers on board. The Apple Developer Program is offered by Apple to anyone who wants to create software for Apple operating systems, including iOS, macOS, watchOS, and tvOS. Apple offers some tools for free, but charges \$99 per year for its SDK. Apps are available through the Apple App Store, which includes the iOS, Mac, iWatch, and Apple TV stores.”) and (b) ¶ 70 (“I assume that, in the but for world, competition from other distribution methods would not reduce Apple’s pricing of its Developer Program, and moreover that developers using other distribution channels would nevertheless value the tools, SDK, and testing provided through the program and would continue to pay the \$99 annually.”)

¹⁸⁸ See, e.g., (a) Economides Report, at ¶ 70 (“I expect that in the but-for world, Apple will provide the Apple Developer program to all potential iOS programmers. ... [who] would continue to pay the \$99 annually.”; and (b) Zoom Deposition of Nicholas Economides, August 4, 2021, at 112:16 – 113:1 (Q: “And is it your opinion in the scenario when the Court has Apple reviewing the apps that are going to be sold only in nonapple app stores in – in that scenario which I identified, that Apple would not charge anything beyond the \$99 that it charges developers currently for making apps available in the Apple App Store?” A: “Yes, broadly I would say, yes. I mean, the \$99 is the present standard fee, and I would expect it to stay the same.”); and (c) Zoom Deposition of Einer Elhauge, July 30, 2021, at 97:2 – 97:5 (Q: “Right. And then there’s an annual fee for developers you mentioned of \$99?” Q: “Yeah. I haven’t made any assumption about that changing.”).

¹⁸⁹ See also Expert Declaration of James E. Malackowski, August 10, 2021 at ¶¶ 177–200.

¹⁹⁰ Expert Declaration of James E. Malackowski, August 10, 2021 at ¶¶ 60–61, 197–208.

¹⁹¹ Expert Declaration of James E. Malackowski, August 10, 2021, at ¶ 199 (“Tim Cook’s testimony made clear that the entire current compensation structure, including the commissions, is how Apple generates a return on its ecosystem of R&D and IP rights. Specifically, Mr. Cook states, ‘The commission is for a number of different things, from developer tools to the APIs and to the customer service that’s provided,’ and ‘Yes. [The commission] provides a return on our – our investment,’ and ‘If we allowed people to link out like that, we would in essence give up the – our total return on our IP.’”)

195. I understand that, in Plaintiffs' but-for world, Apple could no longer require that the App Store be the exclusive platform for transacting native iOS apps, and that third-party app stores would be freely permitted and consumers could sideload native iOS apps directly onto their iPhones.
196. In that but-for world—with alternative third-party iOS app stores and sideloading—developers could choose to circumvent to varying degrees transacting on the App Store and thus circumvent paying Apple a commission for the use of its IP (beyond the \$99 Apple Developer Program fee).
197. In response to such a loss of revenue in the but-for world, Apple would have a strong economic incentive to choose among multiple feasible mechanisms to monetize its IP that do not rely on iOS native app transactions occurring on the App Store.
198. One way in which Apple could monetize its IP in the but-for world is to—alternatively or additionally—choose to implement an ad valorem royalty (i.e., a royalty based on a percentage of revenue) on certain classes of developers and/or apps. This would differ from the current system in that the developer's obligation to pay this new royalty would not be tied to App Store transactions. Rather, the developer's use of Apple's IP in certain fields of use that Apple specifies would trigger the obligation to pay.
199. With this type of ad valorem monetization model, Apple could decide that the scope of value creation covered by its royalty would be both broader in some respects and narrower in some respects than the current scope of the commission requirement.
200. For example, Apple could choose to monetize in-app advertising, which is not currently covered by Apple's commission. Apple might also have incentives to monetize other types of transactions currently exempted from the commission requirement, such as requiring a royalty on transactions facilitated by the app but where the product or service was delivered outside of the app.
201. Simultaneously, Apple could decide to exempt entirely certain developers from the obligation to pay a royalty. For example, Apple could exempt entirely all developers whose annual transaction volumes fall below a certain dollar threshold. As yet another alternative, Apple could adopt tiered programs based on any number of factors.
202. Moreover, to better target such new IP licensing obligations to just the set of developers that choose to utilize Apple's IP without effectively paying for it via commissions on App Store transactions, Apple could be incentivized to provide an offsetting credit or rebate against such new IP licensing obligations to developers that continue to use the App Store and continue to incur commission on App Store transactions in the but-for world. (As noted below, such a rebate mechanism is used in Epic's Unreal Engine license.).
203. Ad valorem licensing regimes are common in many IP licensing settings, and one prominent real-world example exists for Epic Games' software IP. Epic Games offers developers an "End User License Agreement for Publishing" to Epic's Unreal

Engine.^{192,193} This agreement charges developers a 5 percent royalty on all worldwide gross revenue in excess of the first \$1 million in lifetime gross revenue for each product created with the Epic Unreal Engine software.¹⁹⁴ The reach of the royalty requirement is comprehensive, including (a) “any and all sales of a Product to end users through any and all media, including but not limited to digital and retail”; (b) “any and all in-app purchases, downloadable content, microtransactions, subscriptions, sale, transfer, or exchange of content created by end users for use with a Product, or redemption of virtual currency, either within a Product or made externally but which directly affect the operation of the Product”; (c) “revenue from in-app advertising”; and the catch-all (d) “Revenue in any other form actually attributable to a Product (unless excluded below).”¹⁹⁵

204. Another way in which Apple could monetize its IP in the but-for world is by increasing the fixed fees for use of its IP.¹⁹⁶ Apple already has two fixed fees associated with access to its IP: (a) the Apple Developer Program (\$99/year) and (b) the Apple Developer Enterprise Program (\$299/year).¹⁹⁷ To monetize its IP in the but-for world, Apple would have the economic incentives to elaborate on this fixed-fee structure by adding additional categories and tiers based on various criteria, such as which bundles of tools or functionality the developer uses, the types of apps the developer creates, whether the developer offers free or paid apps (or in-app purchases), or the total annual volume of

¹⁹² See “Frequently Asked Questions (FAQ),” Unreal Engine, 2021, <<https://www.unrealengine.com/en-US/faq>>, accessed on August 4, 2021. (“Unreal Engine (UE4) is a complete suite of creation tools for game development, architectural and automotive visualization, linear film and television content creation, broadcast and live event production, training and simulation, and other real-time applications.”). See also “Overview of Unreal Engine,” Packt, <<https://hub.packtpub.com/overview-unreal-engine/>>, accessed on August 5, 2021. (“Unreal Engine is a game engine that helps you make games. The Unreal Engine is made up of several components that work together to drive the game. Its massive system of tools and editors allows you to organize your assets and manipulate them to create the gameplay for your game. Unreal Engine components include a sound engine, physics engine, graphics engine, input and the Gameplay framework, and online module.”)

¹⁹³ See (a) “Unreal® Engine End User License Agreement for Publishing,” Unreal Engine, (hereafter “Unreal Engine EULA for Publishing”), <https://cdn2.unrealengine.com/Unreal+Engine%2Ffaq%2FUnrealEngineEULA_for_Publishing_v15-b9955ec2954f0e09fade11b2d9acefc65cb6ab1.pdf>, accessed on August 4, 2021; (b) “Frequently Asked Questions (FAQ),” Unreal Engine, <<https://www.unrealengine.com/en-US/faq>>, accessed on August 4, 2021; and (c) “Licensing Options,” Unreal Engine, <<https://www.unrealengine.com/en-US/download>>, accessed on August 4, 2021.

¹⁹⁴ Unreal Engine EULA for Publishing, at § 5 (“Royalty”). (“However, no royalty is owned on the following forms of revenue: 1. The first \$1,000,000 in lifetime gross revenue for each Product; 2. Gross revenue attributable to a Product from a calendar quarter during which the gross revenue for such Product is less than \$10,000; 3. The first \$5,000,000 in gross revenue for each Product from the Oculus Store;” There are additional exemptions.)

¹⁹⁵ Unreal Engine EULA for Publishing, at § 5 (“Royalty”).

¹⁹⁶ See, e.g., Malcolm Owen, “Epic versus Apple: What’s at stake if Apple loses,” Apple Insider, May 16, 2021, <<https://appleinsider.com/articles/21/05/16/epic-versus-apple-whats-at-stake-if-apple-loses>>, accessed on August 4, 2021. (“It is unlikely that Apple would pass on the cost of running the App Store onto consumers directly, but if it is forced to recover its costs somehow, this could be in the form of other fees to developers. ... Apple may try to recoup in ways that may be challenging to developers. This could be service charges for hosting files in the App Store, or even higher fees for becoming an Apple Developer in the first place.”)

¹⁹⁷ “How the Program Works,” Apple Developer, 2021, <<https://developer.apple.com/programs/how-it-works>>, accessed on August 5, 2021; “Apple Developer Enterprise Program,” Apple Developer, 2021, <<https://developer.apple.com/programs/enterprise/>>, accessed on August 4, 2021.

the developer's transactions. Apple would be incentivized to set its price for each category and tier of these programs in order to earn an adequate return on its IP.

205. Moreover, like the ad valorem licensing regime discussed above, Apple could decide that the scope of value creation covered by a fixed-fee licensing regime would be both broader in some respects and narrower in some respects than the current scope of the commission requirement.
206. Unity Software ("Unity") provides a real-world example of exactly this kind of fixed-fee monetization model. Unity Software "is the world's leading platform for creating and operating interactive, real-time 3D content."¹⁹⁸ According to the company, "in the fourth quarter of 2020, 71% of the top 1,000 mobile games were made with Unity."¹⁹⁹ Unity provides access to its proprietary IP through a tiered fixed-fee monetization model. These four tiers are as follows, with each tier providing access to additional tools and functionality:²⁰⁰
 - Personal tier: This tier is free, and requires revenue or funding of less than \$100,000 in the last 12 months.
 - Plus tier: This tier costs \$399 per year per user license, and requires revenue or funding of less than \$200,000 in the last 12 months.
 - Pro tier: This tier costs \$1,800 per year per user license, and either this tier or the Enterprise tier is required if revenue or funding is more than \$200,000 in the last 12 months.
 - Enterprise tier: This tier costs \$4,000 per month for every 20 user licenses, and either this tier or the Pro tier is required if revenue or funding is more than \$200,000 in the last 12 months.
207. In addition to these two possible IP monetization models that Apple could choose between in the but-for world, Mr. Malackowski's report discusses a number of other possible IP monetization models.²⁰¹ Because Plaintiffs' experts completely ignore the role and value of Apple's proprietary IP, they fail to properly evaluate the but-for world that follows from Plaintiffs' claims, and as explained below, fail to recognize that alternative IP monetization models would have different impacts on different members of the proposed Developer class.

¹⁹⁸ Unity Software Inc. Form 10-K for the fiscal year ended December 31, 2020, at page 1 (PDF page 9).

¹⁹⁹ Unity Software Inc. Form 10-K for the fiscal year ended December 31, 2020, at page 1 (PDF page 9).

²⁰⁰ "Choose the plan that is right for you," Unity, <<https://store.unity.com/compare-plans>>, accessed on August 4, 2021; "Unity Software Additional Terms," Unity, July 15, 2021, <<https://unity3d.com/legal/terms-of-service/software>>, accessed on August 5, 2021.

²⁰¹ Expert Declaration of James E. Malackowski, August 10, 2021 at ¶¶ 201–208.

X.C. Alternative monetization mechanisms in the but-for world would make some members of the proposed Developer class worse off compared to the actual world

208. Different IP monetization mechanisms that Apple would have the economic incentive to pursue in the but-for world would have differential impacts on members of the proposed Developer class.
209. To the extent Apple seeks to monetize its IP by instituting an ad valorem royalty similar to that delineated in the Epic Unreal Engine license agreement, some developers could be worse off in the but-for world than in the actual world. As an example, consider developers that have apps that are monetized primarily via in-app advertising and only to a small extent by in app purchases. If Apple charged a 5 percent royalty on all revenue, whether generated from app downloads, in-app purchases, or from advertising, the increased royalty obligation on advertising revenue (5 percent in this but-for world versus nothing in the actual world) could easily swamp the decreased royalty obligation from lower royalty obligations on in-app purchases (5 percent in this but-for world versus a 30 percent commission in the actual world).
210. Further, developers, such as those who offer only free apps with no in-app purchases, who are not members of the proposed Developer class—and thus not represented in this litigation—could be harmed by the Plaintiffs’ desired remedy. For example, developers that rely entirely on in-app advertising, and thus have no paid apps or in-app purchases, would be worse off if Apple applied a royalty to in-app advertising. Any imagined responses in the but-for world by app developers that might change their own business strategies would require individual inquiries inconsistent with the commonality associated with an appropriate class.
211. Alternatively, to the extent Apple expands the scope of its IP royalty requirement (relative to the current scope of the commission requirement) by instituting a tiered fixed-fee structure like that of Unity, once again some developers could be worse off in the but-for world than in the actual world. For instance, consider a developer that primarily monetizes from in-app advertising (earning annual ad revenue of, say, \$1,000), but also earns small amounts of revenue from in-app purchases (e.g., \$200 per year). If that developer chose to license Apple’s IP in the but-for world to gain access to a bundle of functionality and features in a fixed-fee tier akin to Unity’s Plus tier—assuming Apple charges the same \$399 for a license in the but-for world that Unity charges—the developer would be worse off in the but-for world. Specifically, in the but-for world, this developer would have to pay \$399 per year for the license (not counting any possible additional commission on its \$200 of in-app purchases) as compared to the \$159 the developer now pays in the actual world (= current \$99 developer fee + 30% x \$200 of in-app purchases).
212. Further, a tiered fixed-fee monetization model that could result from Plaintiffs’ desired remedy would harm developers who are not members of the proposed Developer class—and thus not represented in this litigation. For example, developers that rely entirely on in-app advertising, and thus have no paid apps or in-app purchases, would be worse off if Apple instituted fixed-fee royalty obligations akin to the tiered fixed-fee licensing structure utilized by Unity. Such developers could go from paying nothing

more than the \$99 per year developer fee in the actual world to paying something like \$2,400 per year per user license for a Unity-like Enterprise tier license in the but-for world (or be forced to change their monetization strategy entirely or exit the marketplace).²⁰²

213. Likewise, other IP monetization models, like those delineated in Mr. Malackowski's report, would result in certain members of the Developer class being worse off in the but-for world as compared to the commission requirements of the actual world.²⁰³
214. Thus, determining which developers would be better off in this but-for world, which might be worse off, and the degree to which that is the case, would require individual inquiry into the monetization economics of each developer and the motivated changes of Apple's monetization of its IP in the but-for world.

XI. Consumers that Purchased only (a) Zero–Marginal Cost Apps or (b) Subscription Apps with Advertising Are Uninjured or Benefited by the Challenged Conduct, Compared to the But-For World

215. In this section, I identify two significant groups of apps whose prices in the but-for world (in which Plaintiffs' experts allege commission rates would be lower) would either be unchanged or higher: (1) apps where the developer does not incur a fixed-dollar cost with each purchase and (2) subscription apps with advertising and no fixed-dollar incremental cost (or with advertising revenue that exceeds the incremental cost).
216. Consumers that purchased only these types of apps (or a mixture of the two types) are therefore uninjured by the alleged anticompetitive conduct (i.e., they would be either no better off or would be worse off in the but-for world).
217. Determining which apps falls into these two categories would require individualized inquiry at the app level. Determining which consumers are uninjured due to their exclusively purchasing one or both of these two types of apps would require individualized inquiry at the consumer level coupled with the individualized inquiries at the app level.

²⁰² See "Choose the plan that is right for you," Unity, <<https://store.unity.com/compare-plans>>, accessed on August 4, 2021; "Unity Software Additional Terms," Unity, July 15, 2021, <<https://unity3d.com/legal/terms-of-service/software>>, accessed on August 5, 2021.

²⁰³ Expert Declaration of James E. Malackowski, August 10, 2021, at ¶¶ 201–218. (Mr. Malackowski explains that Apple could use other IP monetization models in the but-for world, such as "charg[ing] a fee for the use of each specific API, developer tool, or software package;" "charg[ing] separately for bundles of developer tools or functionality;" "rais[ing] the developer license fee generally;" "introduc[ing] a developer revenue-based royalty;" "implement[ing] a tiered structure of developer licenses;" or "vary[ing] fee terms based on the size or other characteristics of a particular developer." He discusses that such alternative monetization methods would affect different Developers differently, including that: "Developers might abandon iOS;" "Developers might cease use of beneficial Apple tools, IP, and APIs;" "Developer innovation might wane;" "Developers might raise prices;" "Developers might charge for currently free applications;" "Developers might introduce advertising in currently ad-free applications;" "[s]mall [D]evelopers might be disadvantaged;" "[l]arge [D]evelopers might be advantaged or disadvantaged;" and "Developers might face higher financial risk when developing for iOS.")

XI.A. Individual inquiry is necessary because consumers of apps where the developer does not incur a fixed-dollar marginal cost are uninjured

218. For many apps, an additional purchase of that app or in-app content likely does not generate a material incremental fixed-dollar cost to the developer. For example, many apps provide functionality that is provided entirely from the code in the app; e.g., a calculator app, a text editor, a single-player game. Thus, the developer incurs no additional cost when an end-user purchases the app or in-app content.²⁰⁴
219. The price the developer sets for the app (or in-app content) determines the revenue generated by the app on the App Store. This is the number of downloads multiplied by the price the consumer pays for each download.
220. When the developer does not experience a fixed-dollar per purchase marginal cost from an app download or the purchase of in-app content, the only deduction made from the purchase price before the developer calculates its profit is the commission itself. Thus, the developer's profit from the app net of sunk costs is simply a given fraction of the revenue the app generated on the App Store.²⁰⁵ For example, if the purchases of the app are assessed a 30 percent commission by Apple; the developer retains 70 percent of the revenue generated from the app on the App Store; alternatively, if the purchases are assessed a 15 percent commission, the developer retains 85 percent of that revenue.
221. The key insight that applies in this zero-marginal cost case is that the developer's profit-maximizing choice of price does not depend on the level of Apple's commission. Regardless of what fractional slice of the purchase price the developer receives, the developer's incentive is to pick the purchase price that maximizes the revenue the app generates on the App Store.²⁰⁶ (See the Technical Appendix (section XII) for the proof and an illustration.)
222. Thus, when an app transaction has zero marginal cost to the developer, changes in the commission rate do not pass through to consumers. Consumers that purchase only such apps are uninjured by allegedly excessively high commission rates.
223. Many apps have zero incremental costs to the developer. However, there can be exceptions for numerous reasons, for example when the app uses some intellectual

²⁰⁴ Professor Elhauge appears to agree that many apps have de minimis marginal costs. See Elhauge Deposition, at 40:9 – 40:12 (Q: “Is it your opinion personally that marginal costs for Apple developers are very small?” A: “Yes, generally, yes.”); and 41:1 – 41:6 (“But – but I am not relying on [Professor McFadden] for any assessment that marginal costs are generally small. I’m relying on my own understanding of, you know, ... that there’s not much marginal cost to just, once you have the app, giving somebody another copy of the app.”).

²⁰⁵ Here I exclude the developer's sunk costs, e.g., of developing the app in the first place and joining Apple's Developer Program. These sunk costs have no effect on the developer's profit-maximizing price.

²⁰⁶ This principle holds as well if the developer is contractually obligated to compensate an input to the app on an ad valorem basis, e.g., if the developer compensates a rights holder (of music used in the app, for example) based on a percentage of the app's revenue. The ad valorem payment to the rights holder is equivalent in its impact on the incentives for the choice of price to an increase in the commission rate. Because the developer's choice of profit-maximizing price is independent of the magnitude of the commission rate, it is also independent of any other ad valorem payments made by the developer.

property for which the developer has contracted to pay on a fixed-dollar per transaction basis (rather than an ad valorem basis).²⁰⁷

224. Consumers that purchase only apps with no incremental costs to the developer are uninjured because the developers of these apps would have no economic incentive to lower the prices of these apps in the but-for world.
225. Determining which apps have zero marginal costs versus positive fixed-dollar marginal costs would require individualized inquiries at the app level. Likewise, determining which consumers purchased only these zero marginal cost apps versus apps with positive fixed-dollar marginal costs would require individualized inquiries at the consumer level.

XI.B. Individual inquiry is necessary because consumers of subscription apps with advertising (e.g., newspaper apps) benefitted from the challenged conduct

226. Now I consider a subscription app that also earns in-app advertising revenue for the developer. This advertising revenue is not currently subject to an App Store commission.²⁰⁸
227. I have identified several iOS newspaper/magazine apps that charge a subscription fee and display ads in the app to their subscribers. These include the New York Times, the Wall Street Journal, The Economist, The New Yorker, and Wired.²⁰⁹ This list is not the result of an exhaustive or systematic search. Identifying all such apps would require an app-by-app inquiry.²¹⁰
228. The New York Times earned more revenues from digital advertising (\$229 million) than from print advertising (\$164 million) in 2020. The New York Times' digital advertising revenues were also substantial relative to its revenues from digital-only newspaper subscriptions (\$544 million) in 2020.²¹¹ Dow Jones (the publisher of the Wall Street Journal) earned \$165 million in digital advertising revenues in 2020 – not much less than

²⁰⁷ Nevertheless, with a continuing discrete pricing grid (allowed prices are at \$1 intervals), a small amount of positive marginal cost would not be sufficient to motivate a developer to pass along a lower commission by dropping the price by an entire dollar. More generally: consumers that purchased only 99¢ apps would be uninjured if that continued to be the lowest allowed positive price. Therefore any reduction in the commission in the but-for world would not lower the developer's price.

²⁰⁸ While this analysis is cast in terms of newspapers and magazines, the same analysis applies to other apps that earn revenue from both subscriptions and ads to which the users are exposed. Professor Hitt identifies video-streaming apps that are monetized by both subscriptions and ads, for example Amazon Prime Video, Hulu, Paramount+, Peacock TV, and YouTube TV. (Hitt market-definition appendix, Figure 20.)

²⁰⁹ I provide screenshots in my report backup documenting the appearance of advertisements displayed within these apps to a user with an active subscription.

²¹⁰ Each of the publications listed is highly ranked (according to number of digital subscribers) on the 2020Q4 Update of the Global Digital Subscription Snapshot, produced by FIPP and CeleraOne, ("Global Digital Subscription Snapshot," Q4 2020 Update, FIPP and CeleraOne, 2020, <https://www.fipp.com/wp-content/uploads/2020/12/FIPP_GDS_Snapshot_2020_Q4_V1.pdf>, accessed on August 9, 2021). The New York Times is ranked number 1 with 6.1 million subscribers. The Wall Street Journal is ranked number 3, with 2.35 million subscribers. The Economist is ranked number 9 with 516K subscribers. The New Yorker is ranked number 25 with 240K subscribers. Wired is ranked number 31 with 142K subscribers.

²¹¹ The New York Times Company, 2020 Annual Report, at 35–39, <<https://nytimes-assets.nytimes.com/2021/03/Final-NYT-2020-Annual-Report.pdf>>, accessed on August 8, 2021.

its print advertising revenues (\$194 million) in that year. Dow Jones' digital advertising revenues were also substantial relative to Dow Jones' revenues in 2020 from digital-only subscriptions (\$429 million).²¹²

229. Although subscribers will vary in how much they will use the app over a month, and thus will vary in how many in-app advertisements they will view and/or click on, the developer can calculate a per-subscriber average of its advertising revenue per month from the app. To the developer, this average advertising revenue per subscriber appears as a positive incremental benefit or a *negative* marginal cost because, for each incremental subscription, the developer anticipates on average receiving this much ad revenue (over and above the subscription revenue).
230. When there is per-subscriber advertising revenue, a developer's profit is not just the after-commission share of the revenue the app generates from the App Store. The developer's profit also reflects the positive contribution of that per-subscriber advertising revenue multiplied by the number of subscribers.
231. In this circumstance, a lower commission rate would give the developer an incentive to *increase* its subscription price. In other words, consumers would pay more in the but-for world for subscription apps that generate revenue from in-app advertising. (See the Technical Appendix (section XII) for a proof and illustration of the phenomenon.)
232. The economic intuition is that given any particular commission rate, the developer sets the subscription price to balance the after-commission revenue increasing effects of a higher subscription price against its negative effects on the number of subscribers and therefore on the ad revenue. A declining commission rate elevates the relative importance of subscription revenues in the total earnings of the app, and so the profit maximizing reaction is to shift the subscription price upward to raise subscription revenues at the expense of some ad revenues.
233. The direction the app price responds to a decrease in the commission rate depends on the algebraic sign of the effective marginal cost (i.e., whether it is positive, zero, or negative). Advertising revenue is a negative effective marginal cost, so when there is zero marginal cost but positive advertising revenue, the effective marginal cost is negative; and subscribers of the New York Times, and similar apps, are better off in the actual world than in the but-for world.
234. Thus, consumers that purchased only subscriptions apps with advertising and (e.g., the New York Times app) would be uninjured. The developers of these subscription-with-advertising apps would have the economic incentive to increase the apps' prices in the but-for world.
235. This result amplifies the conclusions of the prior section—that consumers who purchased exclusively zero-marginal cost apps are uninjured by Apple's challenged actions. In addition to those consumers, consumers that exclusively subscribe to apps that carry advertising would be injured by moving to the Plaintiffs' but-for world. It is

²¹² Revenues are calculated based on figures in News Corp, 2020 Annual Report, at 48–50, <<https://newscorp.com/wp-content/uploads/2020/10/news-corp-2020-annual-report.pdf>>, accessed on August 8, 2021. Details of the calculations are included in Publications_Calculations.xlsx.

impossible that common evidence could show classwide adverse impact from the challenged conduct.

I declare under penalty of perjury under the laws of the United States of America that the foregoing is true and correct.

Executed on:

8/10/2021
Date

Robert Willig
Robert D. Willig

XII. Technical Appendix

XII.A. When the developer does not incur a fixed-dollar marginal cost

236. When the developer does not experience a fixed-dollar per purchase marginal cost from an app download or the purchase of in-app content, the developer's profit from the app net of fixed and sunk costs is simply a given fraction of the revenue the app generated on the App Store.
237. The key insight that applies in this zero-marginal cost case is that the developer's profit-maximizing choice of price does not depend on the level of Apple's commission. Regardless of what fractional slice of the purchase price the developer receives, the developer's incentive is to pick the purchase price that maximizes the revenue the app generates on the App Store.
238. This principle is illustrated in Figure 1, which shows two post-commission net revenue curves for a developer. The demand for the app is assumed to be the linear demand function $D(p) = 20 - p$. The fundamental result of this example does not depend on either (a) the particular parameters of the linear-demand function or (b) that the demand function is linear.
239. The lower (red) curve is the developer's ultimate net revenue after Apple deducts its 30 percent commission from the total revenue generated by the app at the App Store. The higher (blue) curve is the developer's ultimate net revenue if instead Apple deducted only a 10 percent commission.
240. In each scenario, the developer would choose the price for the app (represented on the horizontal axis) that maximizes the developer's net revenue (i.e., after the commission is deducted). In this example, when the commission rate is 30 percent, the developer's profit-maximizing price is \$10, because that is the price that corresponds to the highest point on the red net-revenue curve. (See the red triangle.) Moreover, when the commission rate is lower, here 10 percent, the developer's profit-maximizing price is still \$10, because that corresponds to the highest point on the blue curve. (See the blue triangle.)

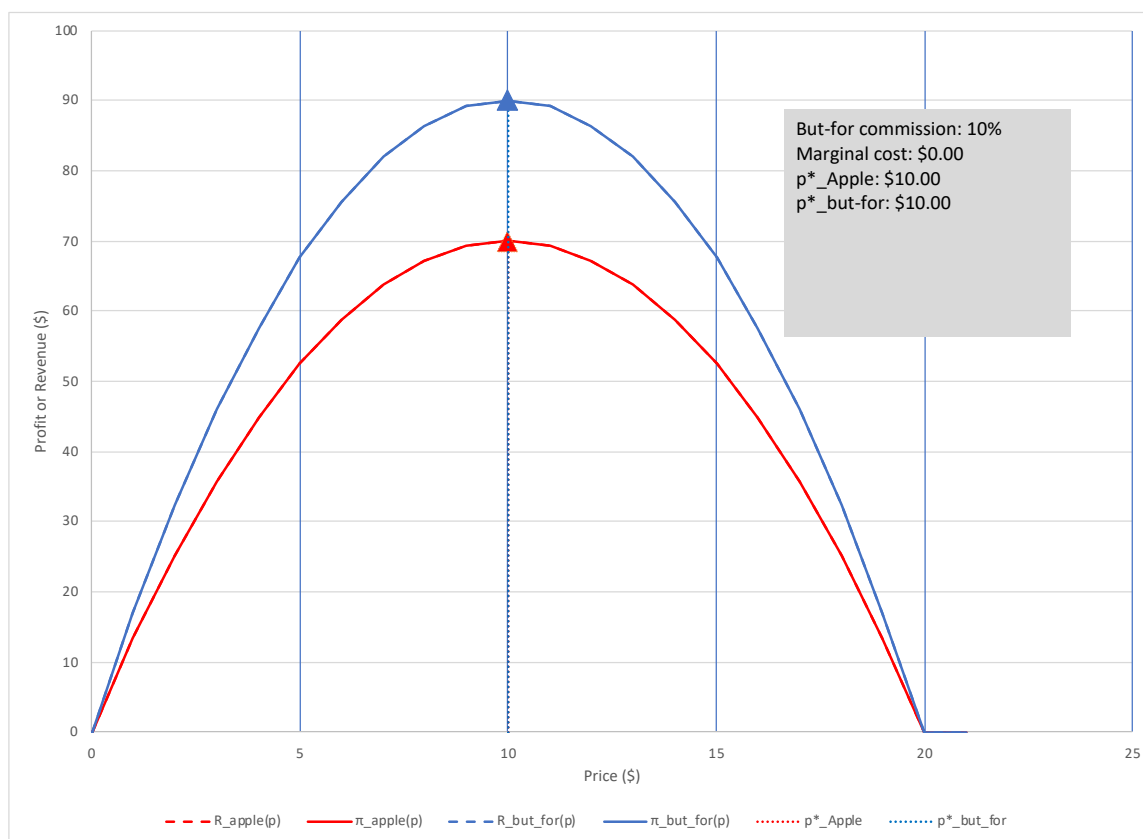


Figure 1: Example illustrating that a developer's choice of profit-maximizing price is independent of the commission rate when the marginal cost of the app to the developer is zero

XII.B. Subscription apps with advertising revenue

241. Now consider a subscription app that also earns in-app advertising revenue for the developer. This advertising revenue is not currently subject to an App Store commission.
242. In this circumstance, a lower commission rate would give the developer an incentive to *increase* its subscription price. In other words, consumers would pay more in the but-for world for subscription apps that generate revenue from in-app advertising.
243. This phenomenon is illustrated in Figure 2, which assumes the same demand curve used in Figure 1. The only difference in this example is the assumption that the developer receives \$5 of advertising revenue per subscriber over the subscription period. (The red and blue dashed curves in Figure 2 are what were the solid red and blue net-revenue curves in Figure 1.)

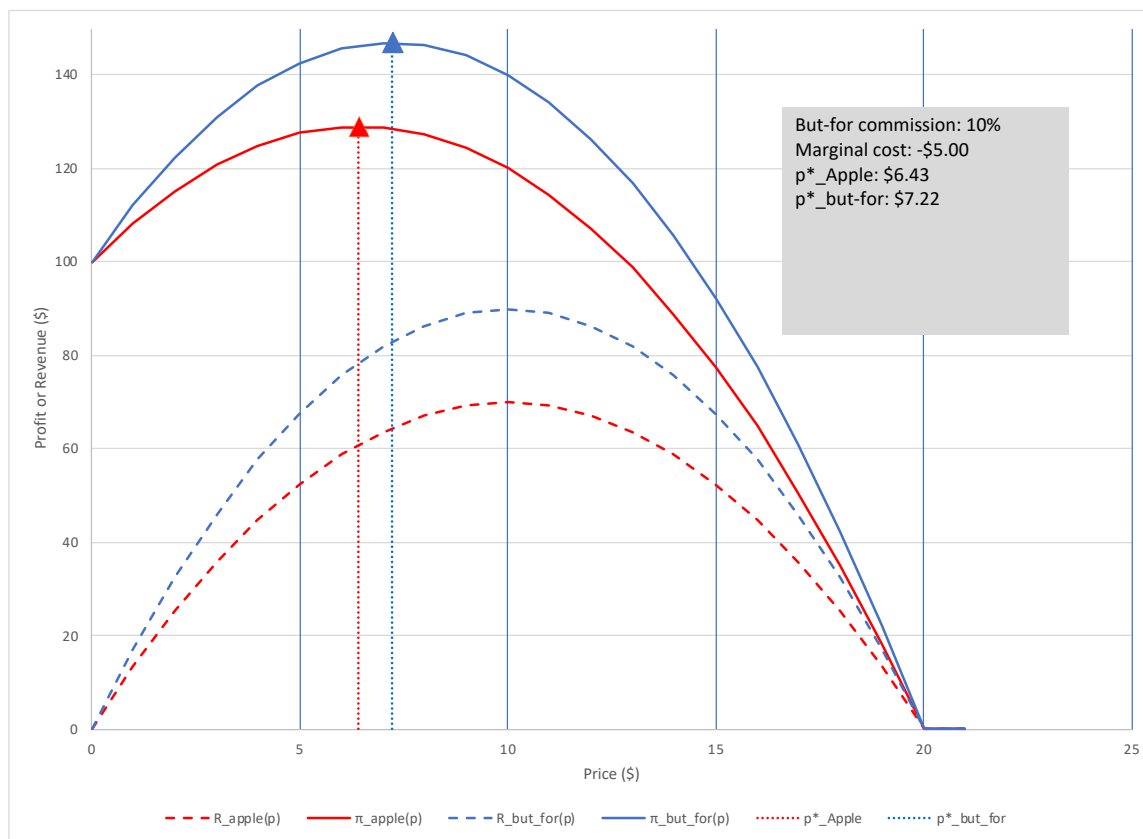


Figure 2: For a subscription app with advertising revenue, a decrease in the App Store commission rate would lead the developer to *increase* the price of the subscription

244. In Figure 2, the solid red curve is the developer's profit when the subscription is subject to a 30 percent commission. Note that it is higher than the dashed red curve that corresponds to net-revenue from the App Store for the same commission rate. This reflects that the developer receives the additional source of revenue from advertising. The developer's profit-maximizing subscription price when the commission rate is 30 percent is \$6.43, which is the price (along the horizontal axis) that corresponds to the red triangle at the highest point on the solid red curve.
245. The solid blue curve is the developer's profit when the subscription is subject to a 10 percent commission. The developer's profit-maximizing subscription price when the commission rate is 10 percent is \$7.22, which is the price (along the horizontal axis) that corresponds to the blue triangle at the highest point on the solid blue curve.
246. First, to confirm what is likely to be a popular intuition: For a given commission rate, a developer that receives ad revenue in addition to subscription revenue will set a lower price than it would if the app earned only subscription revenue. This reflects the developer's added incentive to enlarge the user base in order to earn more ad revenues. Recall from Figure 1 that, when the developer received no advertising revenue, the developer's profit-maximizing price was \$10, regardless of the commission rate. In

Figure 2, the developer's profit-maximizing price is lower than \$10 both (a) for the 30 percent commission rate (the subscription price is \$6.43 rather than \$10.00) and (b) for the 10 percent commission rate (the subscription price is \$7.22 rather than \$10.00). See Table 1, which summarizes the developer's profit-maximizing choices of subscription price based on (a) the commission rate and (b) the per-subscriber ad revenue per subscription period.

247. Figure 2 illustrates the general fact proven in the technical appendix the effect of a lower commission rate on the developer's profit-maximizing subscription price. When the developer earns ad revenue, the lower the commission rate, the *greater* is the developer's profit-maximizing choice of subscription price. This is shown in the bottom row of Table 1: when the commission rate decreases from 30 percent to 10 percent, the developer's profit-maximizing choice of subscription price *increases* from \$6.43 to \$7.22.

**Table 1: Comparing a developer's profit-maximizing price by
(a) per-subscriber ad revenue and (b) commission rate**

Commission rate	30%	10%
No ad revenue	\$10.00	\$10.00
\$5/sub/period	\$6.43	\$7.22

XII.C. Derivation

248. See following pages.

TABLE 1: Summary of key symbols in model

Symbol	Meaning
<i>Choice variable</i>	
p	Price of downloading app (alternatively in-app purchase), charged to end-user.
<i>Consumer demand</i>	
$D(p)$	Demand function for app. Number of units downloaded at price p .
<i>App store's economics</i>	
$\gamma \in [0, 1)$	Commission (percentage) deducted from purchase price p by app store prior to remitting the balance to developer.
<i>Developer's app economics</i>	
c	Marginal cost (e.g., \$/unit) to developer resulting from additional unit of the app.
α	Advertising revenue (e.g., \$/unit) for developer resulting from additional unit of the app.
$\kappa \in [0, 1]$	Ad valorem cost (percentage of price p) to developer resulting from additional unit of the app.
<i>Additional assumption about parameters</i>	
$\kappa + \gamma \leq 1$	Ensures that developer has nonnegative revenue after the app store and its input suppliers take their ad valorem cuts. (This does not address whether the developer's <i>profit</i> is nonnegative because it does not address α and c .)

I Introduction

This analysis considers a developer of an app that sells the app through an app store that acts as the agent in the sense that ① the developer has the authority to choose the price p at which the app is sold and ② the app store acts as the developer's agent to sell the app at the price the developer chooses.

See Table 1 for a summary of key symbols.

The app store charges the developer a commission $\gamma \in [0, 1)$, which the app store deducts from the sale proceeds before remitting the balance to the developer.

The developer may incur a marginal cost c (\$/unit) for each unit of the app sold. For example, the developer may have agreed, as part of a risk-sharing arrangement, to pay the programmer a fixed dollar amount for each app downloaded; or the developer may compensate a rights

holder for a graphical, musical, or other element on the basis of a fixed dollar amount for each app download.

Alternatively the developer may compensate a party based not on the number of downloads but rather as a fraction κ of the developer's (pre-commission) unit sales revenue p .

The developer may realize a marginal dollar-denominated *benefit* α for each unit of the app sold. This models the added revenue from in-app advertising earned per additional subscriber to the app.

II General specification of demand

II.A The developer's profit

The developer's profit, as a function of the price p it chooses, is:

$$\pi(p) = [(1 - \kappa - \gamma)p + (\alpha - c)] D(p). \quad (1)$$

which reflects that, out of the p gross sales revenue per unit, ① the app store takes γp as a commission and ② the developer pays rights holders and/or other input suppliers an amount κp .

II.B The first-order condition for choosing price to maximize profit

The derivative of the developer's profit with respect to p is:

$$\frac{\partial \pi}{\partial p} = (1 - \kappa - \gamma) [pD'(p) + D(p)] + (\alpha - c) D'(p). \quad (2)$$

The first-order condition for choosing the price p^* to maximize profit is:

$$\frac{\partial \pi}{\partial p}(p^*(\gamma); \gamma) = 0, \quad (3)$$

where the γ argument of the p^* function indicates that the profit-maximizing price p^* is a function of the app-store commission rate γ .

II.C Computing the sign of the derivative of p^* with respect to the app-store commission rate γ

Total differentiation of [equation \(3\)](#) with respect to p and γ and the Implicit Function Theorem yield:

$$\frac{dp^*}{d\gamma}(\gamma) \frac{\partial^2 \pi}{\partial p^2}(p^*(\gamma); \gamma) + \frac{\partial^2 \pi}{\partial p \partial \gamma}(p^*(\gamma); \gamma) = 0, \quad (4)$$

so that:

$$\frac{dp^*}{d\gamma}(\gamma) = - \frac{\frac{\partial^2 \pi}{\partial p \partial \gamma}(p^*(\gamma); \gamma)}{\frac{\partial^2 \pi}{\partial p^2}(p^*(\gamma); \gamma)}. \quad (5)$$

The denominator of the right-hand side of [equation \(5\)](#) is negative in at least a neighborhood of $(p^*(\gamma); \gamma)$ because that is the second-order condition for a local profit maximum. Thus the sign of the left-hand side is equal to the sign of the numerator of the right-hand side:

$$\operatorname{sgn}\left(\frac{dp^*}{d\gamma}(\gamma)\right) = \operatorname{sgn}\left(\frac{\partial^2 \pi}{\partial p \partial \gamma}(p^*(\gamma); \gamma)\right).$$

Differentiating [equation \(2\)](#) with respect to γ :

$$\begin{aligned} \frac{\partial^2 \pi}{\partial p \partial \gamma} &= -[D(p) + pD'(p)], \text{ which by (3) is} \\ &= \frac{(\alpha - c)D'(p)}{(1 - \kappa - \gamma)}. \end{aligned}$$

Thus, the sign of $\partial p^*/\partial \gamma$ is the negative of the sign of $\alpha - c$, because $D'(p) < 0$:

$$\operatorname{sgn}\left(\frac{dp^*}{d\gamma}(\gamma)\right) = -\operatorname{sgn}(\alpha - c). \quad (6)$$

III General Conclusions

Thus when per-unit advertising revenue dominates marginal cost, this sign is negative:

- an increase in the commission rate would lead to lower app prices;
- a decrease in the commission rate would lead to higher app prices.

Also, with no advertising revenues and no marginal costs,

- the profit-maximizing choice of the app price is not affected by the commission rate.

Appendix A

August 10, 2021

Curriculum Vitae

Name: Robert D. Willig

Address: 220 Ridgeview Road, Princeton, New Jersey 08540

Birth: 1/16/47; Brooklyn, New York

Marital Status: Married, four children

Education: Ph.D. Economics, Stanford University, 1973
Dissertation: Welfare Analysis of Policies
Affecting Prices and Products.
Advisor: James Rosse

M.S. Operations Research, Stanford University, 1968.

A.B. Mathematics, Harvard University, 1967.

Professional Positions:

Lecturer with the rank of Professor, Princeton School of Public and International Affairs, 9/2020 – 7/2021.

Lecturer with the rank of Professor, Woodrow Wilson School of Public and International Affairs, 2/2017–6/2020.

Professor of Economics and Public Affairs, Emeritus, Princeton University, 7/2016–

Professor of Economics and Public Affairs, Princeton University, 7/1978–6/2016.

Principal External Advisor, Infrastructure Program, Inter-American Development Bank, 6/97–8/98.

Deputy Assistant Attorney General, U.S. Department of Justice, 1989–1991.

Supervisor, Economics Research Department, Bell Laboratories, 1977–1978.

Visiting Lecturer (with rank of Associate Professor), Department of Economics and Woodrow Wilson School, Princeton University, 1977–1978 (part time). Economics Research Department, Bell Laboratories, 1973–1977.

Lecturer, Economics Department, Stanford University, 1971–1973.

Other Professional Activities

Advisory Committee, World Bank Project on Digital Africa for Inclusive Growth 2019-.

ABA Section of Antitrust Law Economics Task Force, 2010–2012.

Advisory Committee, Compass Lexecon 2010–2018

OECD Advisory Council for Mexican Economic Reform, 2008–2009.

Senior Consultant, Compass Lexecon, 2008–

Director, Competition Policy Associates, Inc., 2003–2005.

Advisory Bd., Electronic Journal of I.O. and Regulation Abstracts, 1996–2008.

Advisory Board, Journal of Network Industries, 2004–2010.

Visiting Faculty Member (occasional), International Program on Privatization and Regulatory Reform, Harvard Institute for International Development, 1996–2000.

Member, National Research Council Highway Cost Allocation Study Review Committee, 1995–1998.

Member, Defense Science Board Task Force on the Antitrust Aspects of Defense Industry Consolidation, 1993–1994.

Editorial Board, Utilities Policy, 1990–2001.

Leif Johanson Lecturer, University of Oslo, November 1988.

Member, New Jersey Governor’s Task Force on Market-Based Pricing of Electricity, 1987–1989.

Co-editor, Handbook of Industrial Organization, 1984–1989.

Associate Editor, Journal of Industrial Economics, 1984–1989.

Director, Consultants in Industry Economics, Inc., 1983–1989, 1991–1994.

Fellow, Econometric Society, 1981–

Organizing Committee, Carnegie-Mellon-N.S.F. Conference on Regulation, 1985.

Board of Editors, American Economic Review, 1980–1983.

Nominating Committee, American Economic Association, 1980–1981.

Research Advisory Committee, American Enterprise Institute, 1980–1986.

Editorial Board, M.I.T. Press Series on Government Regulation of Economic Activity, 1979–1993.

Program Committee, 1980 World Congress of the Econometric Society.

Program Committee, Econometric Society, 1979, 1981, 1985.

Organizer, American Economic Association Meetings: 1980, 1982.

American Bar Association Section 7 Clayton Act Committee, 1981.

Principal Investigator, NSF grant SOC79-0327, 1979-80; NSF grant 285-6041, 1980–1982; NSF grant SES-8038866, 1983–1984, 1985–1986.

Aspen Task Force on the Future of the Postal Service, 1978–1980.

Organizing Committee of Sixth Annual Telecommunications Policy Research Conference, 1977–1978.

Visiting Fellow, University of Warwick, July 1977.

Institute for Mathematical Studies in the Social Sciences, Stanford University, 1975.

Published Articles and Book Chapters:

“Intertemporal Failures of the Invisible Hand: Theory and Implications for International Market Dominance,” (with W.J. Baumol), reprinted in Indian Economic Review 65 Years of Selected Papers, Volume 54 – Supplement 1, December 2019, s45–s56.

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“Economics at the FTC: Hospital Mergers, Authorized Generic Drugs, and Consumer Credit Markets” (with Bryan Keating, Paolo Ramezzana, Margaret Guerin-Calvert, and Nauman Ilias), 2012.

“Recommendations for Excessive-Share Limits in the Surfclam and Ocean Quahog Fisheries” (with Glenn Mitchell and Steven Peterson), Report to National Marine Fisheries Service and the Mid-Atlantic Fishery Management Council, 5/23/2011.

“Public Comments on the 2010 Draft Horizontal Merger Guidelines,” paper posted to Federal Trade Commission website, 6/4/2010

“An Economic Perspective on the Antitrust Case Against Intel,” (with Jon Orszag and Gilad Levin), 2009.

“An Econometric Analysis of the Matching Between Football Student-Athletes and Colleges,” (with Yair Eilat, Bryan Keating and Jon Orszag)

Supreme Court Amicus Brief Regarding Morgan Stanley Capital Group Inc. v. Public Utility District No. 1 of Snohomish County, Washington, (co-authored), AEI-Brookings Joint Center Brief No. 07-02, 12/2/07

“(Allegedly) Monopolizing Tying Via Product Innovation,” statement before the Department of Justice/Federal Trade Commission Section 2 Hearings, November 1, 2006.

“Assessment of U.S. Merger Enforcement Policy,” statement before the Antitrust Modernization Commission, 11/17/05.

“Investment is Appropriately Stimulated by TELRIC,” in Pricing Based on Economic Cost, 12/2003.

“Brief of Amici Curiae Economics Professors, re Verizon v. Trinko, In the Supreme Court of the U.S.,” (with W.J. Baumol, J.O. Ordoover and F.R. Warren-Boulton), 7/25/2003.

“Stimulating Investment and the Telecommunications Act of 1996,” (with J. Bigelow, W. Lehr and S. Levinson), 2002.

“An Economic Analysis of Spectrum Allocation and Advanced Wireless Services,” (with Martin N. Baily, Peter R. Orszag, and Jonathan M. Orszag), 2002.

“Effective Deregulation of Residential Electric Service,” 2001.

“Anticompetitive Forced Rail Access” (with W. J. Baumol), 2000.

“The Scope of Competition in Telecommunications” (with B. Douglas Bernheim), 1998.

“Why Do Christie and Schultz Infer Collusion From Their Data? (with Alan Kleidon), 1995.

“Demonopolization,” (with Sally Van Siclen), OECD Vienna Seminar Paper, 1993.

“Economic Analysis of Section 337: The Balance Between Intellectual Property Protection and Protectionism,” (with J. Ordoover) 1990.

“The Effects of Capped NTS Charges on Long Distance Competition,” (with M. Katz).

“Discussion of Regulatory Mechanism Design in the Presence of Research Innovation, and Spillover Effects,” 1987.

“Industry Economic Analysis in the Legal Arena,” 1987.

“Deregulation of Long Distance Telephone Services: A Public Interest Assessment,” (with M. Katz).

“Competition-Related Trade Issues,” report prepared for OECD.

“Herfindahl Concentration Index,” (with J. Ordoover), Memorandum for ABA Section 7 Clayton Act Committee, Project on Revising the Merger Guidelines, March 1981.

“Market Power and Market Definition,” (with J. Ordoover), Memorandum for ABA Section 7

Clayton Act Committee, Project on Revising the Merger Guidelines, May 1981.

“The Continuing Need for and National Benefits Derived from the REA Telephone Loan Programs - An Economic Assessment,” 1981.

“The Economics of Equipment Leasing: Costing and Pricing,” 1980.

“Rail Deregulation and the Financial Problems of the U.S. Railroad Industry,” (with W.J. Baumol), report prepared under contract to Conrail, 1979.

“Price Indexes and Intertemporal Welfare,” Bell Laboratories Economics Discussion Paper, 1974.

“Consumer’s Surplus: A Rigorous Cookbook,” Technical Report #98, Economics Series, I.M.S.S.S., Stanford University, 1973.

“An Economic-Demographic Model of the Housing Sector,” (with B. Hickman and M. Hinz), Center for Research in Economic Growth, Stanford University, 1973.

Invited Conference Presentations:

Concurrences Conference on Antitrust in Life Sciences “Life Science Mergers: New US Rules?”	2021
Israel Competition Authority “Antitrust Analyses of Vertical Combinations”	2019
Griswold Center Symposium “Has the US Economy Become Less Competitive” — moderator	2019
NYU Stern and Concurrence Global Antitrust Economics Conference “Pharmaceutical Industry Antitrust” — moderator	2019
FTC Competition and Consumer Protection Hearings “The State of US Antitrust Law”	2018
Portuguese Competition Authority Public Seminar Series “Ups and Downs of Horizontal and Vertical Mergers”	2017
World Bank Workshop on Digital Technology Adoption, Skills, Productivity and Jobs in Latin America “Discussion of Models of Firm Heterogeneity”	2016
George Mason Law Review Annual Antitrust Symposium: Antitrust in an Interconnected World “GUPPI and the Safe Harbor”	2016

Competition Law & Policy Institute of New Zealand Annual Workshop “Merger Analysis Keynote”	2015
Economic Studies at Brookings: Railroads, Policy and the Economy “The Industry Perspective”	2015
Georgetown University McDonough School of Business Railroad Economics Symposium “The Role of Economic Theory in the ‘Deregulated’ Rail Industry”	2015
Brazilian School of Economics and Finance (FGV EPGE) Seminario “Public Interest Regulation: Lessons from Railroads”	2015
NYU School of Law Conference on the Fiftieth Anniversary of United States v. Philadelphia National Bank: The Past, Present and Future of Merger Law “Discussion with Agency Economists”	2013
Brookings Institution Conference on The Economics of the Airline Industry “Airline Network Effects and Consumer Welfare”	2012
AGEP Public Policy Conference on Pharmaceutical Industry Economics, Regulation and Legal Issues; Law and Economics Center, George Mason University School of Law “Pharmaceutical Brand-Generic Disputes”	2012
U.S.-EU Alliance Study Peer Review Conferences “Review of Cooperative Agreements in Transatlantic Airline Markets”	2012
“The Research Agenda Ahead”	2012
Antitrust in the High Tech Sector Conference “Developments in Merger Enforcement”	2012
Georgetown Center for Business and Public Policy, Conference on the Evolution of Regulation “Reflections on Regulation”	2011
Antitrust Forum, New York State Bar Association “Upward Price Pressure, Market Definition and Supply Mobility”	2011
American Bar Association, Antitrust Section, Annual Convention “The New Merger Guidelines’ Analytic Highlights”	2011
OECD and World Bank Conference on Challenges and Policies for Promoting Inclusive Growth “Inclusive Growth From Competition and Innovation”	2011

Villanova School of Business Executive MBA Conference “Airline Network Effects, Competition and Consumer Welfare”	2011
NYU School of Law Conference on Critical Directions in Antitrust “Unilateral Competitive Effects”	2010
Conference on the State of European Competition Law and Enforcement in a Transatlantic Context “Recent Developments in Merger Control”	2010
Center on Regulation and Competition, Universidad de Chile Law School “Economic Regulation and the Limits of Antitrust Law”	2010
Center on Regulation and Competition, Universidad de Chile Law School “Merger Policy and Guidelines Revision”	2010
Faculty of Economics, Universidad de Chile “Network Effects in Airlines Markets”	2010
Georgetown Law Global Antitrust Enforcement Symposium “New US Merger Guidelines”	2010
FTI London Financial Services Conference “Competition and Regulatory Reform”	2010
NY State Bar Association Annual Antitrust Conference “New Media Competition Policy”	2009
Antitrust Law Spring Meeting of the ABA “Antitrust and the Failing Economy Defense”	2009
Georgetown Law Global Antitrust Enforcement Symposium “Mergers: New Enforcement Attitudes in a Time of Economic Challenge”	2009
Phoenix Center US Telecoms Symposium “Assessment of Competition in the Wireless Industry”	2009
FTC and DOJ Horizontal Merger Guidelines Workshop “Direct Evidence is No Magic Bullet”	2009
Northwestern Law Research Symposium: Antitrust Economics and Competition Policy “Discussion of Antitrust Evaluation of Horizontal Mergers”	2008
Inside Counsel Super-Conference “Navigating Mixed Signals under Section 2 of the Sherman Act”	2008

Federal Trade Commission Workshop on Unilateral Effects in Mergers “Best Evidence and Market Definition”	2008
European Policy Forum, Rules for Growth: Telecommunications Regulatory Reform “What Kind of Regulation For Business Services?”	2007
Japanese Competition Policy Research Center, Symposium on M&A and Competition Policy “Merger Policy Going Forward With Economics and the Economy”	2007
Federal Trade Commission and Department of Justice Section 2 Hearings “Section 2 Policy and Economic Analytic Methodologies”	2007
Pennsylvania Bar Institute, Antitrust Law Committee CLE “The Economics of Resale Price Maintenance and Class Certification”	2007
Pennsylvania Bar Institute, Antitrust Law Committee CLE “Antitrust Class Certification – An Economist’s Perspective”	2007
Fordham Competition Law Institute, International Competition Economics Training Seminar “Monopolization and Abuse of Dominance”	2007
Canadian Bar Association Annual Fall Conference on Competition Law “Economic Tools for the Competition Lawyer”	2007
Conference on Managing Litigation and Business Risk in Multi-jurisdiction Antitrust Matters “Economic Analysis in Multi-jurisdictional Merger Control”	2007
World Bank Conference on Structuring Regulatory Frameworks for Dynamic and Competitive South Eastern European Markets “The Roles of Government Regulation in a Dynamic Economy”	2006
Department of Justice/Federal Trade Commission Section 2 Hearings “(Allegedly) Monopolizing Tying Via Product Innovation”	2006
Fordham Competition Law Institute, Competition Law Seminar “Monopolization and Abuse of Dominance”	2006
Practicing Law Institute on Intellectual Property Antitrust “Relevant Markets for Intellectual Property Antitrust”	2006
PLI Annual Antitrust Law Institute “Cutting Edge Issues in Economics”	2006
World Bank’s Knowledge Economy Forum V “Innovation, Growth and Competition”	2006

Charles University Seminar Series “The Dangers of Over-Ambitious Antitrust Regulation”	2006
NY State Bar Association Antitrust Law Section Annual Meeting “Efficient Integration or Illegal Monopolization?”	2006
World Bank Seminar “The Dangers of Over-Ambitious Regulation”	2005
ABA Section of Antitrust Law 2005 Fall Forum “Is There a Gap Between the Guidelines and Agency Practice?”	2005
Hearing of Antitrust Modernization Commission “Assessment of U.S. Merger Enforcement Policy”	2005
LEAR Conference on Advances in the Economics of Competition Law “Exclusionary Pricing Practices”	2005
Annual Antitrust Law Institute “Cutting Edge Issues in Economics”	2005
PRIOR Symposium on States and Stem Cells “Assessing the Economics of State Stem Cell Programs”	2005
ABA Section of Antitrust Law – AALS Scholars Showcase “Distinguishing Anticompetitive Conduct”	2005
Allied Social Science Associations National Convention “Antitrust in the New Economy”	2005
ABA Section of Antitrust Law 2004 Fall Forum “Advances in Economic Analysis of Antitrust”	2004
Phoenix Center State Regulator Retreat “Regulatory Policy for the Telecommunications Revolution”	2004
OECD Competition Committee “Use of Economic Evidence in Merger Control”	2004
Justice Department/Federal Trade Commission Joint Workshop “Merger Enforcement”	2004
Phoenix Center Annual U.S. Telecoms Symposium “Incumbent Market Power”	2003

Center for Economic Policy Studies Symposium on Troubled Industries “What Role for Government in Telecommunications?”	2003
Princeton Workshop on Price Risk and the Future of the Electric Markets “The Structure of the Electricity Markets”	2003
2003 Antitrust Conference “International Competition Policy and Trade Policy”	2003
International Industrial Organization Conference “Intellectual Property System Reform”	2003
ABA Section of Antitrust Law 2002 Fall Forum “Competition, Regulation and Pharmaceuticals”	2002

Fordham Conference on International Antitrust Law and Policy “Substantive Standards for Mergers and the Role of Efficiencies”	2002
Department of Justice Telecom Workshop “Stimulating Investment and the Telecommunications Act of 1996”	2002
Department of Commerce Conference on the State of the Telecom Sector “Stimulating Investment and the Telecommunications Act of 1996”	2002
Law and Public Affairs Conference on the Future of Internet Regulation “Open Access and Competition Policy Principles”	2002
Center for Economic Policy Studies Symposium on Energy Policy “The Future of Power Supply”	2002
The Conference Board: Antitrust Issues in Today’s Economy “The 1982 Merger Guidelines at 20”	2002
Federal Energy Regulatory Commission Workshop “Effective Deregulation of Residential Electric Service”	2001
IPEA International Seminar on Regulation and Competition “Electricity Markets: Deregulation of Residential Service”	2001
“Lessons for Brazil from Abroad”	2001
ABA Antitrust Law Section Task Force Conference “Time, Change, and Materiality for Monopolization Analyses”	2001
Harvard University Conference on American Economic Policy in the 1990s “Comments on Antitrust Policy in the Clinton Administration”	2001
Tel-Aviv Workshop on Industrial Organization and Anti-Trust “The Risk of Contagion from Multimarket Contact”	2001
2001 Antitrust Conference “Collusion Cases: Cutting Edge or Over the Edge?”	2001
“Dys-regulation of California Electricity”	2001
FTC Public Workshop on Competition Policy for E-Commerce “Necessary Conditions for Cooperation to be Problematic”	2001
HIID International Workshop on Infrastructure Policy “Infrastructure Privatization and Regulation”	2000
Villa Mondragone International Economic Seminar “Competition Policy for Network and Internet Markets”	2000

New Developments in Railroad Economics: Infrastructure Investment and Access Policies “Railroad Access, Regulation, and Market Structure”	2000
The Multilateral Trading System at the Millennium “Efficiency Gains From Further Liberalization”	2000
Singapore – World Bank Symposium on Competition Law and Policy “Policy Towards Cartels and Collusion”	2000
CEPS: Is It a New World?: Economic Surprises of the Last Decade “The Internet and E-Commerce”	2000
Cutting Edge Antitrust: Issues and Enforcement Policies “The Direction of Antitrust Entering the New Millennium”	2000
The Conference Board: Antitrust Issues in Today’s Economy “Antitrust Analysis of Industries With Network Effects”	1999
CEPS: New Directions in Antitrust “Antitrust in a High-Tech World”	1999
World Bank Meeting on Competition and Regulatory Policies for Development “Economic Principles to Guide Post-Privatization Governance”	1999
1999 Antitrust Conference “Antitrust and the Pace of Technological Development” “Restructuring the Electric Utility Industry”	1999 1999
HIID International Workshop on Privatization, Regulatory Reform and Corporate Governance “Privatization and Post-Privatization Regulation of Natural Monopolies”	1999
The Federalist Society: Telecommunications Deregulation: Promises Made, Potential Lost? “Grading the Regulators”	1999
Inter-American Development Bank: Second Generation Issues In the Reform Of Public Services “Post-Privatization Governance” “Issues Surrounding Access Arrangements”	1999 1999
Economic Development Institute of the World Bank — Program on Competition Policy “Policy Towards Horizontal Mergers”	1998

Twenty-fifth Anniversary Seminar for the Economic Analysis Group of the Department of Justice	
“Market Definition in Antitrust Analysis”	1998
HIID International Workshop on Privatization, Regulatory Reform and Corporate Governance	
“Infrastructure Architecture and Regulation: Railroads”	1998
EU Committee Competition Conference – Market Power	
“US/EC Perspective on Market Definition”	1998
Federal Trade Commission Roundtable	
“Antitrust Policy for Joint Ventures”	1998
1998 Antitrust Conference	
“Communications Mergers”	1998
The Progress and Freedom Foundation Conference on Competition, Convergence, and the Microsoft Monopoly	
“Access and Bundling in High-Technology Markets”	1998
FTC Program on The Effective Integration of Economic Analysis into Antitrust Litigation	
“The Role of Economic Evidence and Testimony”	1997
FTC Hearings on Classical Market Power in Joint Ventures	
“Microeconomic Analysis and Guideline”	1997
World Bank Economists — Week IV Keynote	
“Making Markets More Effective With Competition Policy”	1997
Brookings Trade Policy Forum	
“Competition Policy and Antidumping: The Economic Effects”	1997
University of Malaya and Harvard University Conference on The Impact of Globalisation and Privatisation on Malaysia and Asia in the Year 2020	
“Microeconomics, Privatization, and Vertical Integration”	1997
ABA Section of Antitrust Law Conference on The Telecommunications Industry	
“Current Economic Issues in Telecommunications”	1997
Antitrust 1998: The Annual Briefing	
“The Re-Emergence of Distribution Issues”	1997
Inter-American Development Bank Conference on Private Investment, Infrastructure Reform and Governance in Latin America & the Caribbean	
“Economic Principles to Guide Post-Privatization Governance”	1997

Harvard Forum on Regulatory Reform and Privatization of Telecommunications in the Middle East	
“Privatization: Methods and Pricing Issues”	1997
American Enterprise Institute for Public Policy Research Conference	
“Discussion of Local Competition and Legal Culture”	1997
Harvard Program on Global Reform and Privatization of Public Enterprises	
“Infrastructure Privatization and Regulation: Freight”	1997
World Bank Competition Policy Workshop	
“Competition Policy for Entrepreneurship and Growth”	1997
Eastern Economics Association Paul Samuelson Lecture	
“Bottleneck Access in Regulation and Competition Policy”	1997
ABA Annual Meeting, Section of Antitrust Law	
“Antitrust in the 21st Century: The Efficiencies Guidelines”	1997
Peruvian Ministry of Energy and Mines Conference on Regulation of Public Utilities	
“Regulation: Theoretical Context and Advantages vs. Disadvantages”	1997
The FCC: New Priorities and Future Directions	
“Competition in the Telecommunications Industry”	1997
American Enterprise Institute Studies in Telecommunications Deregulation	
“The Scope of Competition in Telecommunications”	1996
George Mason Law Review Symposium on Antitrust in the Information Revolution	
“Introduction to the Economic Theory of Antitrust and Information”	1996
Korean Telecommunications Public Lecture	
“Market Opening and Fair Competition”	1996
Korea Telecommunications Forum	
“Desirable Interconnection Policy in a Competitive Market”	1996
European Association for Research in Industrial Economics Annual Conference	
“Bottleneck Access: Regulation and Competition Policy”	1996
Harvard Program on Global Reform and Privatization of Public Enterprises	
“Railroad and Other Infrastructure Privatization”	1996

FCC Forum on Antitrust and Economic Issues Involved with InterLATA Entry “The Scope of Telecommunications Competition”	1996
Citizens for a Sound Economy Policy Watch on Telecommunications Interconnection “The Economics of Interconnection”	1996
World Bank Seminar on Experiences with Corporatization “Strategic Directions of Privatization”	1996
FCC Economic Forum on the Economics of Interconnection “Lessons from Other Industries”	1996
ABA Annual Meeting, Section of Antitrust Law “The Integration, Disintegration, and Reintegration of the Entertainment Industry”	1996
Conference Board: 1996 Antitrust Conference “How Economics Influences Antitrust and Vice Versa”	1996
Antitrust 1996: A Special Briefing “Joint Ventures and Strategic Alliances”	1996
New York State Bar Association Section of Antitrust Law Winter Meeting “Commentary on Horizontal Effects Issues”	1996
FTC Hearings on the Changing Nature of Competition in a Global and Innovation-Driven Age “Vertical Issues for Networks and Standards”	1995
Wharton Seminar on Applied Microeconomics “Access Policies with Imperfect Regulation”	1995
Antitrust 1996, Washington D.C. “Assessing Joint Ventures for Diminution of Competition”	1995
ABA Annual Meeting, Section of Antitrust Law “Refusals to Deal — Economic Tests for Competitive Harm”	1995
FTC Seminar on Antitrust Enforcement Analysis “Diagnosing Collusion Possibilities”	1995
Philadelphia Bar Education Center: Antitrust Fundamentals “Antitrust — The Underlying Economics”	1995

Vanderbilt University Conference on Financial Markets “Why Do Christie and Schultz Infer Collusion From Their Data?”	1995
ABA Section of Antitrust Law Chairs Showcase Program “Discussion of Telecommunications Competition Policy”	1995
Conference Board: 1995 Antitrust Conference “Analysis of Mergers and Joint Ventures”	1995
ABA Conference on The New Antitrust: Policy of the ‘90s “Antitrust on the Super Highways/Super Airways”	1994
ITC Hearings on The Economic Effects of Outstanding Title VII Orders “The Economic Impacts of Antidumping Policies”	1994
OECD Working Conference on Trade and Competition Policy “Empirical Evidence on The Nature of Anti-dumping Actions”	1994
Antitrust 1995, Washington D.C. “Rigorous Antitrust Standards for Distribution Arrangements”	1994
ABA — Georgetown Law Center: Post Chicago-Economics: New Theories - New Cases? “Economic Foundations for Vertical Merger Guidelines”	1994
Conference Board: Antitrust Issues in Today’s Economy “New Democrats, Old Agencies: Competition Law and Policy”	1994
Federal Reserve Board Distinguished Economist Series “Regulated Private Enterprise Versus Public Enterprise”	1994
Institut d’Etudes Politiques de Paris “Lectures on Competition Policy and Privatization”	1993
Canadian Bureau of Competition Policy Academic Seminar Series, Toronto. “Public Versus Regulated Private Enterprise”	1993
CEPS Symposium on The Clinton Administration: A Preliminary Report Card “Policy Towards Business”	1993
Columbia Institute for Tele-Information Conference on Competition in Network Industries, New York, NY “Discussion of Deregulation of Networks: What Has Worked and What Hasn’t”	1993

World Bank Annual Conference on Development Economics “Public Versus Regulated Private Enterprise”	1993
Center for Public Utilities Conference on Current Issues Challenging the Regulatory Process “The Economics of Current Issues in Telecommunications Regulation”	1992
“The Role of Markets in Presently Regulated Industries”	1992
The Conference Board’s Conference on Antitrust Issues in Today’s Economy, New York, NY “Antitrust in the Global Economy”	1992
“Monopoly Issues for the ‘90s”	1993
Columbia University Seminar on Applied Economic Theory, New York, NY “Economic Rationales for the Scope of Privatization”	1992
Howrey & Simon Conference on Antitrust Developments, Washington, DC “Competitive Effects of Concern in the Merger Guidelines”	1992
Arnold & Porter Colloquium on Merger Enforcement, Washington, DC “The Economic Foundations of the Merger Guidelines”	1992
American Bar Association, Section on Antitrust Law Leadership Council Conference, Monterey, CA “Applying the 1992 Merger Guidelines”	1992
OECD Competition Policy Meeting, Paris, France “The Economic Impacts of Antidumping Policy”	1992
Center for Public Choice Lecture Series, George Mason University Arlington, VA “The Economic Impacts of Antidumping Policy”	1992
Brookings Institution Microeconomics Panel, Washington, DC, “Discussion of the Evolution of Industry Structure”	1992
AT&T Conference on Antitrust Essentials “Antitrust Standards for Mergers and Joint Ventures”	1991
ABA Institute on The Cutting Edge of Antitrust: Market Power “Assessing and Proving Market Power: Barriers to Entry”	1991
Second Annual Workshop of the Competition Law and Policy Institute of New Zealand “Merger Analysis, Industrial Organization Theory, and Merger Guidelines”	1991
“Exclusive Dealing and the Fisher & Paykel Case”	1991
Special Seminar of the New Zealand Treasury “Strategic Behavior, Antitrust, and The Regulation of Natural Monopoly”	1991

Public Seminar of the Australian Trade Practices Commission “Antitrust Issues of the 1990’s”	1991
National Association of Attorneys General Antitrust Seminar “Antitrust Economics”	1991
District of Columbia Bar’s 1991 Annual Convention “Administrative and Judicial Trends in Federal Antitrust Enforcement”	1991
ABA Spring Meeting “Antitrust Lessons From the Airline Industry”	1991
Conference on The Transition to a Market Economy - Institutional Aspects “Anti-Monopoly Policies and Institutions”	1991
Conference Board’s Thirtieth Antitrust Conference “Antitrust Issues in Today’s Economy”	1991
American Association for the Advancement of Science Annual Meeting “Methodologies for Economic Analysis of Mergers”	1991
General Seminar, Johns Hopkins University “Economic Rationales for the Scope of Privatization”	1991
Capitol Economics Speakers Series “Economics of Merger Guidelines”	1991
CRA Conference on Antitrust Issues in Regulated Industries “Enforcement Priorities and Economic Principles”	1990
Pepper Hamilton & Scheetz Anniversary Colloquium “New Developments in Antitrust Economics”	1990
PLI Program on Federal Antitrust Enforcement in the 90’s “The Antitrust Agenda of the 90’s”	1990
FTC Distinguished Speakers Seminar “The Evolving Merger Guidelines”	1990
The World Bank Speakers Series “The Role of Antitrust Policy in an Open Economy”	1990
Seminar of the Secretary of Commerce and Industrial Development of Mexico “Transitions to a Market Economy”	1990

Southern Economics Association	
“Entry in Antitrust Analysis of Mergers”	1990
“Discussion of Strategic Investment and Timing of Entry”	1990
American Enterprise Institute Conference on Policy Approaches to the Deregulation of Network Industries	
“Discussion of Network Problems and Solutions”	1990
American Enterprise Institute Conference on Innovation, Intellectual Property, and World Competition	
“Law and Economics Framework for Analysis”	1990
Banco Nacional de Desenvolvimento Economico Social Lecture	
“Competition Policy: Harnessing Private Interests for the Public Interest”	1990
Western Economics Association Annual Meetings	
“New Directions in Antitrust from a New Administration”	1990
“New Directions in Merger Enforcement: The View from Washington”	1990
Woodrow Wilson School Alumni Colloquium	
“Microeconomic Policy Analysis and Antitrust — Washington 1990”	1990
Arnold & Porter Lecture Series	
“Advocating Competition”	1991
“Antitrust Enforcement”	1990
ABA Antitrust Section Convention	
“Recent Developments in Market Definition and Merger Analysis”	1990
Federal Bar Association	
“Joint Production Legislation: Competitive Necessity or Cartel Shield?”	1990
Pew Charitable Trusts Conference	
“Economics and National Security”	1990
ABA Antitrust Section Midwinter Council Meeting	
“Fine-tuning the Merger Guidelines	1990
“The State of the Antitrust Division”	1991
International Telecommunications Society Conference	
“Discussion of the Impact of Telecommunications in the UK”	1989
The Economists of New Jersey Conference	
“Recent Perspectives on Regulation”	1989

Conference on Current Issues Challenging the Regulatory Process	
“Innovative Pricing and Regulatory Reform”	1989
“Competitive Wheeling”	1989
Conference Board: Antitrust Issues in Today’s Economy	
“Foreign Trade Issues and Antitrust”	1989
McKinsey & Co. Mini-MBA Conference	
“Economic Analysis of Pricing, Costing, and Strategic Business Behavior”	1989
Olin Conference on Regulatory Mechanism Design	
“Revolutions in Regulatory Theory and Practice: Exploring The Gap”	1989
University of Dundee Conference on Industrial Organization and Strategic Behavior	
“Mergers in Differentiated Product Industries”	1988
Leif Johanson Lectures at the University of Oslo	
“Normative Issues in Industrial Organization”	1988
Mergers and Competitiveness: Spain Facing the EEC	
“Merger Policy”	1988
“R&D Joint Ventures”	1988
New Dimensions in Pricing Electricity	
“Competitive Pricing and Regulatory Reform”	1988
Program for Integrating Economics and National Security: Second Annual Colloquium	
“Arming Decisions Under Asymmetric Information”	1988
European Association for Research in Industrial Economics	
“U.S. Railroad Deregulation and the Public Interest”	1987
“Economic Rationales for the Scope of Privatization”	1989
“Discussion of Licensing of Innovations”	1990
Annenberg Conference on Rate of Return Regulation in the Presence of Rapid Technical Change	
“Discussion of Regulatory Mechanism Design in the Presence of Research, Innovation, and Spillover Effects”	1987
Special Brookings Papers Meeting	
“Discussion of Empirical Approaches to Strategic Behavior”	1987
“New Merger Guidelines”	1990
Deregulation or Regulation for Telecommunications in the 1990’s	
“How Effective are State and Federal Regulations?”	1987

Conference Board Roundtable on Antitrust	
“Research and Production Joint Venture”	1990
“Intellectual Property and Antitrust”	1987
Current Issues in Telephone Regulation	
“Economic Approaches to Market Dominance: Applicability of Contestable Markets”	1987
Harvard Business School Forum on Telecommunications	
“Regulation of Information Services”	1987
The Fowler Challenge: Deregulation and Competition in The Local Telecommunications Market	
“Why Reinvent the Wheel?”	1986
World Bank Seminar on Frontiers of Economics	
“What Every Economist Should Know About Contestable Markets”	1986
Bell Communications Research Conference on Regulation and Information	
“Fuzzy Regulatory Rules”	1986
Karl Eller Center Forum on Telecommunications	
“The Changing Economic Environment in Telecommunications: Technological Change and Deregulation”	1986
Railroad Accounting Principles Board Colloquium	
“Contestable Market Theory and ICC Regulation	1986
Canadian Embassy Conference on Current Issues in Canadian — U.S. Trade and Investment	
“Regulatory Revolution in the Infrastructure Industries”	1985
Eagleton Institute Conference on Telecommunications in Transition	
“Industry in Transition: Economic and Public Policy Overview”	1985
Brown University Citicorp Lecture	
“Logic of Regulation and Deregulation”	1985
Columbia University Communications Research Forum	
“Long Distance Competition Policy”	1985
American Enterprise Institute Public Policy Week	
“The Political Economy of Regulatory Reform”	1984
MIT Communications Forum	
“Deregulation of AT&T Communications”	1984

Bureau of Census Longitudinal Establishment Data File and Diversification Study Conference “Potential Uses of The File”	1984
Federal Bar Association Symposium on Joint Ventures “The Economics of Joint Venture Assessment”	1984
Hoover Institute Conference on Antitrust “Antitrust for High-Technology Industries”	1984
NSF Workshop on Predation and Industrial Targeting “Current Economic Analysis of Predatory Practices”	1983
The Institute for Study of Regulation Symposium: Pricing Electric, Gas and Telecommunications Services Today and for the Future “Contestability As A Guide for Regulation and Deregulation”	1984
University of Pennsylvania Economics Day Symposium “Contestability and Competition: Guides for Regulation and Deregulation”	1984
Pinhas Sapir Conference on Economic Policy in Theory and Practice “Corporate Governance and Market Structure”	1984
Centre of Planning and Economic Research of Greece “Issues About Industrial Deregulation”	1984
	1984
Hebrew and Tel Aviv Universities Conference on Public Economics “Social Welfare Dominance Extended and Applied to Excise Taxation”	1983
NBER Conference on Industrial Organization and International Trade “Perspectives on Horizontal Mergers in World Markets”	1983
Workshop on Local Access: Strategies for Public Policy “Market Structure and Government Intervention in Access Markets”	1982
NBER Conference on Strategic Behavior and International Trade “Industrial Strategy with Committed Firms: Discussion”	1982
Columbia University Graduate School of Business, Conference on Regulation and New Telecommunication Networks “Local Pricing in a Competitive Environment”	1982

International Economic Association Roundtable Conference on New Developments in the Theory of Market Structure	
“Theory of Contestability”	1982
“Product Dev., Investment, and the Evolution of Market Structures”	1982
N.Y.U. Conference on Competition and World Markets: Law and Economics	
“Competition and Trade Policy — International Predation”	1982
CNRS-ISPE-NBER Conference on the Taxation of Capital	
“Welfare Effects of Investment Under Imperfect Competition”	1982
Internationales Institut für Management und Verwaltung Regulation Conference	
“Welfare, Regulatory Boundaries, and the Sustainability of Oligopolies”	1981
NBER-Kellogg Graduate School of Management Conference on the Econometrics of Market Models with Imperfect Competition	
“Discussion of Measurement of Monopoly Behavior: An Application to the Cigarette Industry”	1981
The Peterkin Lecture at Rice University	
“Deregulation: Ideology or Logic?”	1981
FTC Seminar on Antitrust Analysis	
“Viewpoints on Horizontal Merger”	1982
“Predation as a Tactical Inducement for Exit”	1980
NBER Conference on Industrial Organization and Public Policy	
“An Economic Definition of Predation”	1980
The Center for Advanced Studies in Managerial Economics Conference on The Economics of Telecommunication	
“Pricing Local Service as an Input”	1980
Aspen Institute Conference on the Future of the Postal Service	
“Welfare Economics of Postal Pricing”	1979
Department of Justice Antitrust Seminar	
“The Industry Performance Gradient Index”	1979
Eastern Economic Association Convention	
“The Social Performance of Deregulated Markets for Telecom Services”	1979
Industry Workshop Association Convention	
“Customer Equity and Local Measured Service”	1979

Symposium on Ratemaking Problems of Regulated Industries "Pricing Decisions and the Regulatory Process"	1979
Woodrow Wilson School Alumni Conference "The Push for Deregulation"	1979
NBER Conference on Industrial Organization "Intertemporal Sustainability"	1979
World Congress of the Econometric Society "Theoretical Industrial Organization"	1980
Institute of Public Utilities Conference on Current Issues in Public Utilities Regulation "Network Access Pricing"	1978
ALI-ABA Conference on the Economics of Antitrust "Predatoriness and Discriminatory Pricing"	1978
AEI Conference on Postal Service Issues "What Can Markets Control?"	1978
University of Virginia Conference on the Economics of Regulation "Public Interest Pricing"	1978
DRI Utility Conference "Marginal Cost Pricing in the Utility Industry: Impact and Analysis"	1978
International Meeting of the Institute of Management Sciences "The Envelope Theorem"	1977
University of Warwick Workshop on Oligopoly "Industry Performance Gradient Indexes"	1977
North American Econometric Society Convention "Intertemporal Sustainability"	1979
"Social Welfare Dominance"	1978
"Economies of Scope, DAIC, and Markets with Joint Production"	1977
Telecommunications Policy Research Conference "Transition to Competitive Markets"	1986
"InterLATA Capacity Growth, Capped NTS Charges and Long Distance Competition"	1985
"Market Power in The Telecommunications Industry"	1984
"FCC Policy on Local Access Pricing"	1983
"Do We Need a Regulatory Safety Net in Telecommunications?"	1982

“Anticompetitive Vertical Conduct”	1981
“Electronic Mail and Postal Pricing”	1980
“Monopoly, Competition and Efficiency”: Chairman	1979
“A Common Carrier Research Agenda”	1978
“Empirical Views of Ramsey Optimal Telephone Pricing”	1977
“Recent Research on Regulated Market Structure”	1976
“Some General Equilibrium Views of Optimal Pricing”	1975
 National Bureau of Economic Research Conference on Theoretical Industrial Organization	
“Compensating Variation as a Measure of Welfare Change”	1976
 Conference on Pricing in Regulated Industries: Theory & Application	
“Ramsey Optimal Pricing of Long Distance Telephone Services”	1977
 NBER Conference on Public Regulation	
“Income Distributional Concerns in Regulatory Policy-Making”	1977
 Allied Social Science Associations National Convention	
“Merger Guidelines and Economic Theory”	1990
Discussion of “Competitive Rules for Joint Ventures”	1989
“New Schools in Industrial Organization”	1988
“Industry Economic Analysis in the Legal Arena”	1987
“Transportation Deregulation”	1984
Discussion of “Pricing and Costing of Telecommunications Services”	1983
Discussion of “An Exact Welfare Measure”	1982
“Optimal Deregulation of Telephone Services”	1982
“Sector Differentiated Capital Taxes”	1981
“Economies of Scope”	1980
“Social Welfare Dominance”	1980
“The Economic Definition of Predation”	1979
Discussion of “Lifeline Rates, Succor or Snare?”	1979
“Multiproduct Technology and Market Structure”	1978
“The Economic Gradient Method”	1978
“Methods for Public Interest Pricing”	1977
Discussion of “The Welfare Implications of New Financial Instruments”	1976
“Welfare Theory of Concentration Indices”	1976
Discussion of “Developments in Monopolistic Competition Theory”	1976
“Hedonic Price Adjustments”	1975
“Public Good Attributes of Information and its Optimal Pricing”	1975
“Risk Invariance and Ordinally Additive Utility Functions”	1974
“Consumer’s Surplus: A Rigorous Cookbook”	1974
 University of Chicago Symposium on the Economics of Regulated Public Utilities	
“Optimal Prices for Public Purposes”	1976

American Society for Information Science	
“The Social Value of Information: An Economist’s View”	1975
Institute for Mathematical Studies in the Social Sciences Summer Seminar	
“The Sustainability of Natural Monopoly”	1975
U.S.-U.S.S.R. Symposium on Estimating Costs and Benefits of Information Services	
“The Evaluation of the Economic Benefits of Productive Information”	1975
NYU-Columbia Symposium on Regulated Industries	
“Ramsey Optimal Public Utility Pricing”	1975

Research Seminars:

Bell Communications Research (2)	Bell Laboratories (numerous)
Carleton University	Carnegie-Mellon University
Columbia University (4)	Cornell University (2)
Department of Justice (3)	Electric Power Research Institute
Federal Reserve Board	Federal Trade Commission (4)
Georgetown University	Harvard University (2)
Hebrew University	Johns Hopkins University (2)
M. I. T. (4)	Mathematica
New York University (4)	Northwestern University (2)
Norwegian School of Economics and Business Administration	Princeton University (many)
Rand	Rice University
S.U.N.Y. Albany	Stanford University (5)
Universite Laval	University of California, San Diego
University of Chicago	University of Delaware
University of Florida	University of Illinois
University of Iowa (2)	University of Maryland

University of Michigan

University of Minnesota

University of Oslo

University of Pennsylvania (3)

University of Toronto

University of Virginia

University of Wisconsin

University of Wyoming

Vanderbilt University

World Bank (4)

Yale University (2)

Appendix B

Expert Testimony of Robert Willig

July 16, 2017 to August 10, 2021

In re: Domestic Drywall Antitrust Litigation, In the United States District Court for the Eastern District of Pennsylvania, MDL No. 2437 13-MD-2437, Expert Report 03/13/15; Deposition 4/9/15, 4/10/15; Expert Report 01/26/18; Expert Report 02/26/18; Deposition 05/31/18.

Application of the National Railroad Passenger Corporation Under 49 U.S.C. § 24308(a) – Canadian National Railway Company; Before the Surface Transportation Board, Docket No. FD 35743; Verified Statement, 9/4/2015; Rebuttal Verified Statement, 9/14/2017.

The Coca-Cola Company & Subs. v. Commissioner of Internal Revenue, in the United States Tax Court, Docket No. 31183-15, Expert Report 6/29/2017, Rebuttal Report 9/28/17, Deposition 12/19/17, Trial Testimony 4/5/18 and 4/6/18.

In re: Automotive parts antitrust litigation -- Bearings Cases; in the United States District Court for the Eastern District of Michigan Southern Division, Master File No. 12-md-02311; 2:12-cv-00501-MOB-MKM; Declaration in Support of Defendants' Opposition to Direct Purchaser Plaintiffs' Motion for Class Certification and Appointment of Class Counsel, 7/26/2017, Deposition 10/13/2017; Declaration in Support of Defendants' Reply in Support of Defendants' Joint Motion to Exclude the Proposed Expert Reports and Testimony of Drs. McClave and Langenfeld, 12/14/17; Declaration in Support of Defendants' Brief in Opposition to Direct Purchaser Plaintiffs' Revised Motion for Class Certification and Appointment of Class Counsel, 12/13/2019, Deposition 1/21/2020; Declaration In Support Of Defendants' Replies In Support Of Their Joint Motions To Exclude The Proposed Expert Reports And Testimonies Of Dr. James T. McClave And Dr. James Langenfeld, April 13, 2020.

In re: General Motors LLC Ignition Switch Litigation, in the U.S. District Court for the Southern District of New York, No. 14-MD-2543 (JMF), Expert Report 2/23/2018, Expert Report 4/20/2018, Supplemental Tables, 5/7/2018, Deposition 5/8/2018 and 5/9/2018.

CPV Power Holdings et. al. v. PJM Interconnection, L.L.C., Before the Federal Energy Regulatory Commission, Docket No. EL18-169-000, Declaration 06/20/18.

In Re Thalomid and Revlimid Antitrust Litigation, in the U.S. District Court for the District of New Jersey, Civil No. 14-6997 (MCA) (MAH), Expert Report 08/27/18, Deposition 10/25/2018.

In Re Djeneba Sidibe et al, v. Sutter Health, Case No. 3: 12-cv-4854-LB, in the U.S. District Court for the Northern District of California, Expert Declaration (class) 9/21/2018, Deposition 11/8/2018, Sur-Reply Declaration (class) 1/7/2019, Expert Report (merits) 6/21/2019, Deposition 7/24/2019, Supplemental Declaration (class) 1/31/2020 and corrected 2/25/2020, Deposition 2/25/2020, Supplemental Expert Report (merits) 3/12/2021, Rebuttal Expert Report (merits) 4/16/2021, Deposition 5/7/2021. Declaration (in support of motion to exclude opinions by Dr. Tasneem Chifty) 5/28/2021.

In Re UFCW & Employers Benefit Trust, et al v. Sutter Health, et al., Case No. CGC-14-538451, Consolidated with Case No. CGC-18-565398, People of the State of California, ex rel. et al v. Sutter Health, before the Superior Court of the State of California for the City and County of San Francisco, Expert Report 10/29/2018, Deposition 12/17-18/2018, Addendum to Expert Report 3/26/2019, Response to Supplemental Merits Expert Declaration of Jeffrey J. Leitzinger 4/16/2019, Response to Second Supplemental Expert Declaration of Jeffrey J. Leitzinger 6/10/2019.

In Re Christopher Dicesare et al v. The Charlotte-Mecklenburg Hospital Authority, d/b/a Carolinas Healthcare System, in the General Court of Justice State of North Carolina Superior Court Division County of Mecklenburg, Case No. 16-CVS-16404, Expert Report 12/7/2018, Deposition 3/8/2019.

In Re Epipen (Epinephrine Injection, USP) Marketing, sales practices and antitrust litigation; Sanofi-Aventis US, LLC v. Mylan Inc., et al.; before the United States District Court for the District of Kansas, Case No. 2:17-md-2785 and Case No. 2:17-cv-2452; expert report March 25, 2019; Deposition May 19, 2019.

In Re Mylan N.V. Securities Litigation; Abu Dhabi Investment Authority vs. Mylan N.V. and Mylan Inc; before the United States District Court Southern District of New York; Case No. 1:16-CV-07926 (JPO), Case No. 1:20-cv-01342 (JPO); Expert rebuttal report 6/30/2021.

In the Matter of: Determination of Royalty Rates and Terms for Ephemeral Recording and Digital Performance of Sound Recordings (WEB V); Before the United States Copyright Royalty Judges; Docket No. 19-CRB-0005-WR (2021-2025); Written Direct Testimony 9/23/2019 Amended 12/11/2019, Written Rebuttal Testimony 1/10/2020, Deposition 3/3/2020, Trial Testimony 8/5, 6, 10, 25/2020.

In Re Epipen (Epinephrine Injection, USP) Marketing, Sales Practices And Antitrust Litigation; before the United States District Court for the District of Kansas, Case No. 2:17-md-2785 and Case No. 2:17-cv-2452; expert report December 23, 2019, deposition 2/4/2020, declaration 7/15/2020.

Statutory Review of the System for Regulating Rates and Classes for Market Dominant Products, before the Postal Regulatory Commission, Docket No. RM2017-3, Expert Declaration 2/3/2020.

In Re: Home Depot U.S.A., Inc., V. Lafarge North America Inc., In The United States District Court Eastern District Of Pennsylvania, Case Number: 2:18-cv-05305-MMB, expert reports 6/15/2020, 10/2/2020, Deposition 8/17/2020.

In the Matter of: Illumina, Inc. and GRAIL, Inc., Before the Federal Trade Commission, Docket No. 9401, Expert Declaration July 16, 2021, Deposition August 1, 2021.

Appendix C

List of Materials Relied On		
Expert Report and Declaration of Robert D. Willig		
Document Title / Bates Number		Date
<u>Legal</u>		
	Donald R. Cameron, et al. v. Apple Inc., Plaintiffs’ Consolidated Class Action Complaint for Violations of the Sherman Act and California Unfair Competition Law	30-Sep-19
	Donald R. Cameron, et al. v. Apple Inc., Developer Plaintiffs’ Motion for Class Certification	1-Jun-21
	In re Apple iPhone Antitrust Litigation, Third Amended Consolidated Class Action Complaint	11-Sep-20
	In re Apple iPhone Antitrust Litigation, Plaintiffs’ Notice of Motion and Motion for Class Certification; Memorandum of Points and Authorities, at Memorandum of Points and Authorities	1-Jun-21
<u>Expert Materials</u>		
	Expert Class Certification Report of Professor Einer Elhauge	1-Jun-21
	Expert Class Certification Report of Professor Nicholas Economides	1-Jun-21
	Expert Report of Daniel L. McFadden in support of Plaintiffs’ Motion for Class Certification	1-Jun-21
	Class Certification Opposition Expert Report of Richard Schmalensee, Ph.D.	10-Aug-21
	Expert Declaration of Lorin Hitt, Ph.D.	10-Aug-21
	Expert Declaration of James E. Malackowski	10-Aug-21
	Expert Declaration of Dr. Itamar Simonson	10-Aug-21
	Expert Report of David S. Evans, Epic Games, Inc., v. Apple Inc.	15-Feb-21
	Rebuttal Expert Report of Lorin Hitt, Ph.D., Epic Games, Inc., v. Apple Inc.	15-Mar-21
	Supplement to Rebuttal Expert Report of Lorin Hitt, Ph.D., Epic Games, Inc., v. Apple Inc.	17-Mar-21
<u>Depositions</u>		
	Economides, Nicholas	4-Aug-21
	Elhauge, Einer	30-Jul-21
	McFadden, Daniel	3-Aug-21
<u>Hearings</u>		
	Online Platforms and Market Power, Part 6: Examining the Dominance of Amazon, Apple, Facebook, and Google: Hearing before the Subcommittee on Antitrust, Commercial, and Administrative Law, Mr. Cook’s Responses to Questions for the Record from the Honorable David N. Cicilline	29-Jul-20
	Transcript of Proceedings, Epic Games, Inc. vs. Apple, Inc., No. C-20-5640 YGR, Volume 1	3-May-21
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	Transcript of Proceedings, Epic Games, Inc. vs. Apple, Inc., No. C-20-5640 YGR, Volume 11	17-May-21
	Transcript of Proceedings, Epic Games, Inc. vs. Apple, Inc., No. C-20-5640 YGR, Volume 12	18-May-21
<u>Other Legal Cases</u>		
	FTC v. Staples, Inc., 190 F. Supp. 3d 100 - Dist. Court, Dist. of Columbia, May 10 2016, citing the expert report of Carl Shapiro	
	Ohio v. American Express Co., 138 S. Ct. 2274	
	Professor Carl Shapiro, “Staples-Office Depot Merger Analysis,” April 7, 2016, redacted public version, Case 1:15-cv-02115-EGS, PX06500-001 – 082, < https://www.ftc.gov/system/files/documents/cases/170216staples_redacted_shapiro_demonstrative.pdf >, accessed on August 4, 2021	
<u>Academic Texts and Articles</u>		
	ABA, <i>Market Power Handbook: Competition Law and Economic Foundations</i> , 2005, at page 112	
	Carl Shapiro, “The 2010 Horizontal Merger Guidelines: From Hedgehog to Fox in Forty Years,” <i>Antitrust Law Journal</i> , 77, 2010, 701–759	
	Carl Shapiro and David J. Teece, “Systems competition and aftermarkets: an economic analysis of <i>Kodak</i> ,” <i>The Antitrust Bulletin</i> , 39(1), 1994, 135–162	

David S. Evans and A. Jorge Padilla, "Excessive Prices: Using Economics to Define Administrable Legal Rules," <i>Journal of Competition Law and Economics</i> , 1(1), 2005, 97–122	
Eric Emch and T. Scott Thompson, "Market Definition and Market Power in Payment Card Networks," <i>Review of Network Economics</i> , 5(1), March 2006, 45–60	
Franklin M. Fisher and John J. McGowan, "On the Misuse of Accounting Rates of Return to Infer Monopoly Profits," <i>American Economic Review</i> , 73(1), 1983, 82–97	
Janusz A. Ordover and Robert D. Willig, "The 1982 Department of Justice Merger Guidelines: An Economic Assessment," <i>California Law Review</i> , 71, 1983, 535	
Jean-Pierre Dubé, Günter J. Hitsch, and Peter E. Rossi, "Do Switching Costs Make Markets Less Competitive?," <i>Journal of Marketing Research</i> , 46(4), 2009, 435–445	
Jonathan B. Baker, "Market Definition: An Analytical Overview," <i>Antitrust Law Journal</i> , 74, 2007, 129–173	
Joseph Farrell and Paul Klemperer, "Coordination and Lock-in: Competition with Switching Costs and Network Effects," in <i>Handbook of Industrial Organization</i> , Volume 3, eds. Mark Armstrong and Robert H. Porter, 2007, 1967–2072	
Krishna A. Cerilli, "Staples/Office Depot: Clarifying Cluster Markets," <i>Competition Policy International</i> , August 2016	
Lapo Filistrucchi, Damien Geradin, Eric van Damme, and Pauline Affeldt, "Market Definition in Two-Sided Markets: Theory and Practice," <i>Journal of Competition Law & Economics</i> , 10(2), 2014, 293–339	
Lawrence J. White, "Market Power and Market Definition in Monopolization Cases," in <i>Issues in Competition Law and Policy</i> , Volume II, 2008, 913–924	
Philip B. Nelson and Lawrence J. White (2003) "Market Definition and the Identification of Market Power in Monopolization Cases: A Critique and a Proposal," NYU Faculty Digital Archives, < http://archive.nyu.edu/handle/2451/26179 >, accessed on August 4, 2021	
William J. Baumol, "Predation and the Logic of the Average Variable Cost Test," <i>Journal of Law and Economics</i> , 39(1), 1996, 49–72	
William J. Baumol and Daniel G. Swanson, "The New Economy and Ubiquitous Competitive Price Discrimination: Identifying Defensible Criteria of Market Power," <i>Antitrust Law Journal</i> , 70(3), 2003, 661–685	
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News Corp, 2020 Annual Report	
The New York Times Company, 2020 Annual Report	
Unity Software Inc. Form 10-K for the fiscal year ended December 31, 2020	
U.S. Department of Justice and Federal Trade Commission, Antitrust Guidelines for the Licensing of Intellectual Property, January 12, 2017	
U.S. Department of Justice and Federal Trade Commission, Horizontal Merger Guidelines, August 19, 2010	
U.S. Department of Justice and Federal Trade Commission, Horizontal Merger Guidelines, 1992	
U.S. Department of Justice and Federal Trade Commission, Vertical Merger Guidelines, June 30, 2020	
<u>News, Press, and Websites</u>	
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"Agreements and Guidelines for Apple Developers," Apple Developer, < https://developer.apple.com/support/terms/ >	10-Aug-21
"App Store Review Guidelines," Apple Developer, < https://developer.apple.com/app-store/review/guidelines/ >	10-Aug-21
"Apple announces App Store Small Business Program," Apple newsroom, November 18, 2020, < https://www.apple.com/newsroom/2020/11/apple-announces-app-store-small-business-program/ >	10-Aug-21
"Apple Developer Agreement," Apple Developer, June 7, 2021, < https://developer.apple.com/support/downloads/terms/apple-developer-agreement/Apple-Developer-Agreement-20210607-English.pdf >	10-Aug-21
"Apple Developer Enterprise Program," Apple Developer, < https://developer.apple.com/programs/enterprise/ >	4-Aug-21

"Apple Launches Subscriptions on the App Store," Apple Newsroom, February 15, 2011, < https://www.apple.com/newsroom/2011/02/15Apple-Launches-Subscriptions-on-the-App-Store/ >	10-Aug-21
"Apple Video Partner Program," Apple Developer, < https://developer.apple.com/programs/video-partner/ >	10-Aug-21
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"Principles and Practices," App Store, < https://www.apple.com/uz/ios/app-store/principles-practices/ >	10-Aug-21
"Steve Jobs introduces the App store - iPhone SDK Keynote," YouTube » gamingandtechnology, March 13, 2008, < https://www.youtube.com/watch?v=xo9cKe_Fch8 >	10-Aug-21
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